AVIATION WEEK
A McGRAW-HILL PUBLICATION
MAR. 13, 1950

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LINE MATERIAL Airport Lighting

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power the Lockheed XF-90 penetration fighter

The tactical sweeps assigned to this Air Force fighter take it far behind enemy lines. Such missions demand the maximum in fuel economy, performance and reliability of the aircraft's power plant.

To meet these requirements, Lockheed selected Westinghouse J-34 Turbojets. Their small frontal area and light weight . . . characteristic of Westinghouse axial-flow design . . . make possible high performance fighters like the XF-90.

J-34-000

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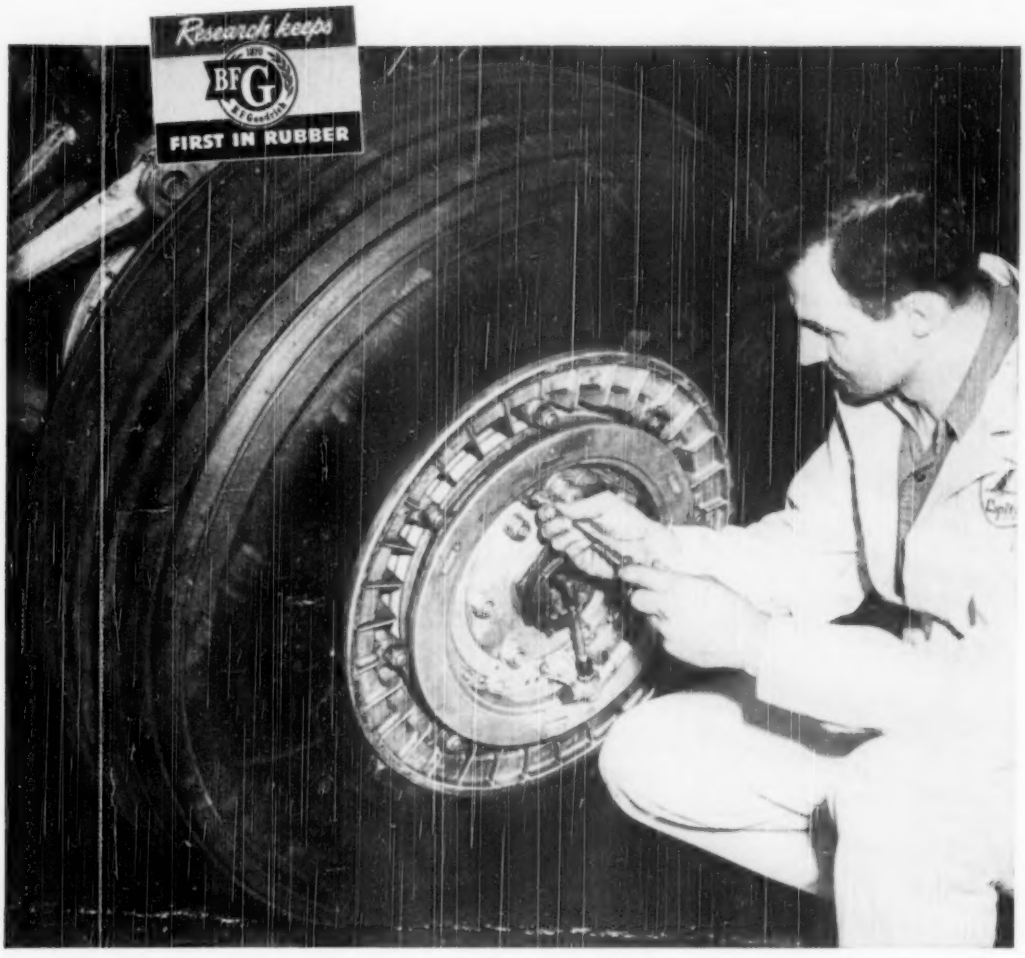
AVIATION GAS TURBINES



Now DC-4 operators, too, can cut brake maintenance costs

THE AIRLINES that have switched their DC-3s to B. F. Goodrich brakes have made important reductions in maintenance costs. TWA reports substantial savings on its Stratoliner brake maintenance after making the switch. Now DC-4 operators can do the same!

The CAA has approved B.F.Goodrich brakes for the DC-4, following extensive tests by Capital Airlines.

Simple design is the reason behind the low upkeep of B. F. Goodrich Expander Tube brakes. Many of the extra parts and linkages found in other brakes are eliminated. A screwdriver and wrench are the only tools needed for relining. Full-circle braking action and low-pressure operation make for slower, more even wear. New, cemented brake blocks that use no rivets permit use of *all* the lining. As a result, maintenance man-hours, flying-time losses and replacement costs are all cut!

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The B. F. Goodrich brake also saves weight. It can be designed lighter for a given amount of kinetic energy than any other brake.

Here are a few of the planes that are reaping these benefits of the BFG wheel and brake assembly: Stratocruiser, B-36, Constitution, B-47, Navion, C-124, B-45, P2V4, F-84, converted DC-3s, converted Stratoliners. Put your DC-4s in this good company. *The B.F.Goodrich Company, Aeronautical Div., Akron, O.*

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Aviation Week

Volume 52 **March 13, 1950** **Number 11**

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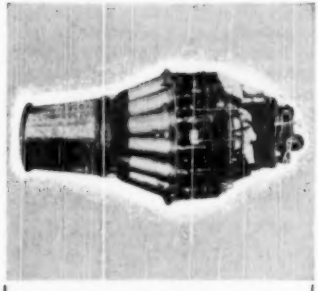
Martin's new P4M Mercator looks like a twin-engine plane. Actually each of its nacelles houses two engines—a J-33 turbojet in addition to the Wasp Major piston engine.

THERMOFLEX BLANKETS

. . . insulate engine cones of Martin P4M "Mercator"



J-M Thermoflex Insulation Blanket applied to exhaust cone of the J-33 turbojet engine used in the Mercator. This light weight, flexible insulation both protects adjacent parts of the plane from the intense heat and contributes to the efficiency of the jet propulsion.

SHIELDING the air frame of this new Navy plane against the intense heat generated during takeoffs and high speed runs under jet power was a problem that called for insulation of a very special kind.

The answer was found—as it has been for most other current model jet-powered planes—in Johns-Manville Thermoflex Insulation Blankets.

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*Btu in. per hr. per sq. ft. per degree F

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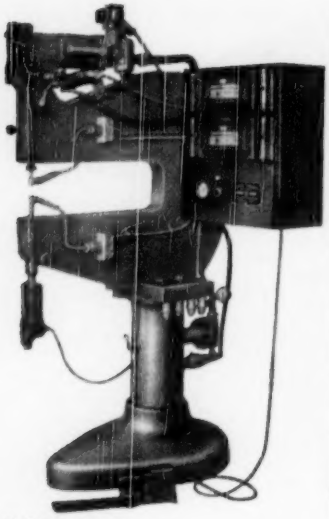

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NEWS DIGEST

DOMESTIC

NWA Martin 2-0-2 crashed into a residence outside Minneapolis Airport while attempting an instrument landing during a blizzard. Early reports indicated all ten passengers and crew of three were killed, two residents of the house killed and three critically injured.

First commercial use of jet engine pod installations under study of Boeing Airplane Co. for the Stratocruiser is expected to increase cruising speed of the big airplanes around 40 mph., give increased rate of climb and make it possible to carry higher gross weight for which the airframe is already stressed. One Boeing study contemplates use of two Westinghouse J-34 turbojets slung in pods at wingtips. This engine is rated up to 3400 thrust lb. and would give the Stratocruiser a total of 6800 thrust lb. in addition to power from its four Wasp Major reciprocating engines. The studies have been shown to engineers of airlines using the Stratocruisers, with especial reference to the trans-Atlantic routes, and have reportedly been well received in a preliminary stage. It is estimated that the new version would carry enough higher gross weight to carry extra fuel load for the jets as well as possibly additional weight for cargo or passengers.

Second and final Glenn L. Martin DB-51, three-jet-engined ground support bomber built for USAF, is undergoing ground tests. First has been under flight test four months. After flight tests of second, both will go to Air Materiel Command for service evaluation.

Personal and executive plane shipments in January totaled 152 by eight companies, Personal Aircraft Council of Aircraft Industries Assn. reports. Included among the two- to ten-place craft: 108 of four places or more, 44 two-place. Total dollar value was $844,000 against $520,000 for 102 shipments the previous month.

Vice Adm. John W. Reeves, Jr., Naval air training chief, will be retired for age May 1, then recalled to active duty to head an enlarged Naval Inspector General's office.

Bell Aircraft Corp. Buffalo, has decided to transfer its Prime Mover operation to an independent company. The Prime Mover Co. has been formed at Muscatine, Iowa, to manufacture and distribute the product. Bell is continuing to accept orders and make deliveries from its own plant, and will participate in the new company for at least 15 years.

United Air Lines expects to take delivery Mar. 31 on the first of five DC-6s ordered last August. All the new planes should be on hand by the end of June.

A Kansas Air National Guard Thunderjet flew the 232 miles from Amarillo, Tex., to Oklahoma City, Okla., in 19 min. at an average of 732 mph. Pilot was Capt. Ivan Behel of the 127th Fighter Squadron at Wichita, Kans. Republic Aviation Corp., which made the plane, said a "healthy tailwind" helped.

Henry Bray Taylor, 57, veteran flyer and flight safety expert, died at San Francisco of a heart ailment. He had been CAA safety agent at San Francisco Airport.

FINANCIAL

Ryan Aeronautical Co. earnings for the 1949 fiscal year ended Oct. 31 were $358,052, equivalent to 91 cents per share on outstanding shares, compared with $356,603, or 90 cents per share, the preceding year. Gross revenue in 1949 was $15,014,564, of which the Airplane division accounted for $8,736,821 and Metal Products division $6,277,743.

Westinghouse Electric Corp. reported 1949 net income of $67,268,555. The amount, largest year's net in company history, equalled $4.95 a share on common stock after preferred stock dividends, and compared with 1948 net income of $55,656,351, or $4.11 a share on common stock. In its annual report, the company disclosed that 1949 jet engine production was 50 percent above 1948.

INTERNATIONAL

Panair do Brasil, affiliate of Pan American World Airways, is seriously considering purchase of de Havilland Comets for use in Brazil. Paulo Sampaio, president of the line, went to England at de Havilland invitation for the Turbojet-powered Comet's final test late in February.

Linea Aeropostal Venezolana, government-owned Venezuelan operator, has received a foreign air carrier permit from the Civil Aeronautics Board to fly between Maiquetia (Caracas), Venezuela, and Montreal, Canada, via Havana and New York for three years. The rights are identical with those given LAV in 1946. LAV recently was given the aviation safety award for 1949 by the Inter-American Safety Council.

Iberia, Spanish airline, will be granted a Mexican permit to start commercial air service between Madrid and Mexico City.

Mobilization Planning—A Staff Report

Air force industrial mobilization planning slashed by so-called "economy" in two successive years is falling farther and farther behind its long-range schedule.

Typical of preparedness curtailments necessitated by Defense Department budget cuts is a recent statement by Maj. Gen. O. R. Cook, AMC director of procurement and industrial planning, that it has been necessary because of cutbacks to scratch 18 out of an original 58 manufacturers' methods projects previously selected for investigation by USAF funds in 1950.

Overall industrial planning budget for 1950 for the Air Force was cut approximately from $16.9 million originally requested in the Truman budget, to $15 million, and the 1951 budget has been further reduced to $14 million.

Manufacturing methods studies have proved one of the most profitable forms of industrial planning, since they result in designing and developing of new high-volume tooling and production methods, improved basic metalworking techniques and new types of production equipment and processes, aimed at large savings of manhours and increased production volume for all-out industrial mobilization.

Purchasing the necessary engineering and technical services to develop this improved volume production knowhow, is especially important in the case of aircraft components, whose manufacturers cannot afford to develop such techniques themselves with the low volume orders for components currently provided.

Available for industrial preparedness measures for 1951 under President Truman's budget will be $10.5 million, as compared to $13 million originally allotted for fiscal 1950, a reduction of approximately 20 percent in the face of the rapid continuing expansion of Russian airpower. (The $13 million was later reduced to $10.6 million for 1950 by order of Secretary Johnson.)

Industrial preparedness measures for 1951 break down into seven categories:

- **Mobilization preparedness,** $2,747,087.
- **Licensor-licensee contracts,** $2,065,994.
- **Subcontractor preparedness contracts,** $370,000.
- **Basic studies,** $100,000.
- **Manufacturing methods,** $4,694,000.
- **Materials planning,** $525,000.
- **Air Force contribution** to Joint Armed Services Medical Procurement Agency, $31,619.

Example of the planning that is being done under these contracts is the case of the Pratt & Whitney R-4360 engine which currently powers the Convair B-36 and Boeing B-50 bombers, and Fairchild C-119 and Douglas C-124 transport planes. After planning with the prime contractor, Pratt & Whitney, is sufficiently developed, it is extended by contract into licensor-licensee contracts with the automobile companies who have accepted licenses to produce the engine in wartime—Ford, Nash and Buick. The licensor and licensee companies then select subcontractors and vendors, makers of valves, forgings, castings, accessories and components, etc., who will be asked to plan their contributions to a wartime level of production of this engine. Similar contracts cover such mobilization items as:

- **Wright R-1300 engine** for the T-28 North American trainer.
- **GE J-47** and Allison J-35 engines.
- **Curtiss and Hamilton Standard** propellers for the B-50 and C-119.
- **Radio and radar equipment.**
- **Fire-control systems.**
- **Bombing system components.**
- **Turbo-superchargers.**
- **Airframes** of North American F-86, Republic F-84, Boeing B-47 and Boeing B-50, where licensing presents unusual problems.

Vital in the overall planning is the materials program which takes the lead in conserving critical materials such as cobalt and columbium and developing substitutes for them. It also develops plastics and increasing uses in aircraft and missiles for magnesium, stainless steel and other more plentiful materials.

The basic studies made by industrial researchers under other contracts estimate and project the industry potential and determine the kind and amount of resources required to support such a potential. They develop these estimates and projections through fact gathering followed by analyses and interpretation.

Of the $14-million total asked for 1951, maintenance of four reserve Air Force plants requires $1,654,000. Plants are at Omaha, Marietta, Ga., Cleveland Municipal Airport and Lockland, Ohio. Twenty-five other Air Force-owned plants are under lease to commercial enterprises and are available in emergency for Air Force production within 60 days, but are maintained by the lessor companies.

Out of the $14 million also comes $605,000 for maintenance and corrosion prevention on the reserve of 30,287 machine tools; 15,497 related production equipment items; 2234 electric motors, and 6998 hand tools and gauges, held for use in event of industrial mobilization. (It has been reported recently that many of these machine tools are not in readiness (AVIATION WEEK, Jan. 30) because no defective parts have been replaced or even ordered, and that it would take a delay of almost a year before they could be put into operation, when the machines were reactivated.)

Brig. Gen. A. A. Kessler, Jr., USAF staff director of procurement and industrial planning, recently admitted to Congress that nearly 10 percent of the total 1951 industrial planning budget was for salaries and travel expenses of Defense Department personnel. Gen. Kessler said that out of the $14-million total budget, $1,111,700 went for salaries and $95,200 for travel expenses.

Kessler emphasized the importance of high grade planning personnel and continuity of personnel in the planning work, and the need for their travel to confer with aircraft industry leaders at their plants.

He also emphasized the importance of the overall program in shortening the time required in an emergency for "our production machinery to reach high gear."

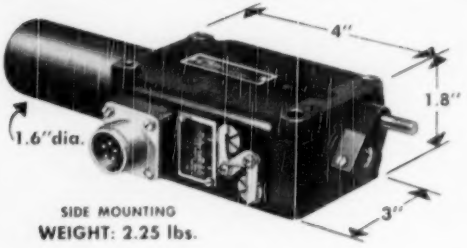
"With these funds," said Kessler, "we are buying time."

But Gen. Kessler omitted mentioning to Congress that the amounts pared from the industrial planning budgets, large percentage-wise but relatively small in dollars compared to other defense budget items, would have bought more time, if they had been retained.

Perhaps in the long-range planning schedule, they could buy enough more time to make the decisive difference between victory and defeat.

The New COMPACT

ELECTRIC ROTARY ACTUATOR



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AVIATION CALENDAR

Mar. 15—Engine Technical Committee-Propeller Technical Committee regular meeting, Aircraft Industries Assn. offices, Washington, D. C.

Mar. 15-16—85th National Aircraft Standards Committe, Hotel Congressional, Washington, D. C.

Mar. 24—Fifth annual flight propulsion meeting, sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland.

Mar. 27-28—American Society for Testing Materials, Committee D-14, spring meeting, 1916 Race St., Philadelphia.

Mar. 28-31—National Plastics Exposition, sponsored by Society of the Plastics Industry, Navy Pier, Chicago.

Mar. 30-31—Sixth annual helicopter forum, sponsored by the American Helicopter Society and the Institute of the Aeronautical Sciences, Ben Franklin Hotel, Philadelphia.

Mar. 31—Greater New York Safety Council conference on air travel safety, Hotel Statler, New York, N. Y.

Apr. 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Continental, Kansas City.

Apr. 4-8—National Production Exposition, sponsored by the Chicago Technical Societies Council, Stevens Hotel, Chicago.

Apr. 6—120th National Aircraft Standards Committee western division meeting, Aircraft Industries Assn. offices, Los Angeles, Calif.

Apr. 10-12—Annual convention, American Society of Lubrication Engineers, Hotel Statler, Detroit.

Apr. 12—American Society of Mechanical Engineers, Aviation and Gas Turbine division, Hotel Statler, Washington, D. C.

Apr. 16-20—Annual business meeting, American Assn. of Airport Executives, Neil House Hotel, Columbus, Ohio.

Apr. 17-19—1950 aeronautic meeting, Society of Automotive Engineers, Hotel Statler, New York City.

Apr. 24-26—Airport Operators Council, third annual meeting, Hotel Carter, Cleveland.

Apr. 26—Stainless steel valve clinic, sponsored by Cooper Alloy Foundry Co., Hotel Statler, Buffalo.

Apr. 29-30—Fifth annual southeastern air show and exposition, Jacksonville, Fla.

May 3-4—15th National Aircraft Standards Committee national meeting, Aircraft Industries Assn. offices, Los Angeles, Calif.

May 5-6—Midwestern conference on fluid dynamics and the national meeting of the American Physical Society, fluid dynamics division, University of Illinois, Urbana.

May 18-20—Annual Meeting of Women's National Aeronautical Assn., Tulsa, Okla.

May 19-20—Seventh annual personal aircraft meeting, sponsored by Institute of Aeronautical Sciences, Lassen Hotel, Wichita, Kans.

PICTURE CREDITS

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WHO'S WHERE

Changes

▶ **Merger**—W. D. Strohmeier, former president of Strohmeier Associates, aviation public relations and advertising firm, has been named vice president in the merger of his company with Davis-Parsons, Inc., New York.

▶ **New Appointments**—Mathieson Chemical Corp. appointed **Stanley De J. Osborne** vice president and treasurer. He was vp, traffic, sales, for Eastern Air Lines . . . **Jim Rice**, former engineer with Airworthiness Section, CAB Safety Bureau, joined Aircraft Industries Assn. to take charge of technical committee activities on the West Coast . . . Kellett Aircraft Corp., Camden, N. J., made **Charles A. Barnett** chief engineer . . . New sales manager for Romec division of Lear, Inc., is **R. S. "Rusty" Atkinson.** He was with American Airlines for 10 years, and was service manager for Parker Appliance Co. . . . Aeroproducts division of General Motors named **R. C. Treseder** and **T. P. Williams** assistant chief engineers. Treseder was chief design engineer and is former head of Air Materiel Command's propeller test laboratory. Williams was section head of model shop, chemical and metallurgical laboratories for Aeroproducts. He has been with GM more than 10 years.

Franklin D. (Jimmy) Walker has joined the Hartford, Conn., office of Platt-Forbes, Inc., advertising agency and will handle copy for United Aircraft's division. He was in Fairchild's public relations office until the company-wide reshuffle last fall.

Elections and Honors

Gill Robb Wilson, aviation columnist of the New York Herald Tribune, has been designated Republican candidate for U. S. Representative in New Jersey's Fourth Congressional District. Wilson is former New Jersey State Aviation Director . . . **Governor Earl Warren** has appointed **Earl D. Prudden,** vp at Ryan Aeronautical Co., to California Aeronautics Commission . . . New director of Aircraft Maintenance International, Inc., is **Guy W. Vaughan,** former chairman of the board of Curtiss-Wright. Firm provides maintenance and overhaul service on contract basis exclusively to airlines, and pending construction of permanent hangars, has been servicing airlines in temporary facilities at Idlewild. Vaughan also is a director of Manufacturers Trust Co., T. E. Conklin Brass & Copper Co., and a member of the executive committee of Western Electric Co., Inc. . . . Southern Airways has elected four new directors. They are: **Robert Z. Cates,** Spartanburg, S. C.; **Cecil A. Beasley, Jr.,** Washington, D. C.; **Ekton B. Stephens** and **Ernest H. Woods,** of Birmingham, Ala. Beasley also was named assistant secretary and **F. L. McLeod** was named assistant treasurer . . . Piedmont Aviation, Inc., made **R. D. Hager** vice president, traffic, and assistant to the president.

INDUSTRY OBSERVER

▶ **French Navy carrier Dixmude (CVE type) was slated to leave Norfolk last week carrying a capacity flight deck load of Grumman F9F and Vought F4U fighters as the first physical participation of the U. S. Navy under the mutual defense assistance program of the North Atlantic Pact. Planes were drawn from storage at Navy bases, modernized and ferried to Norfolk for the delivery. Carrier also is a U. S.-built craft, originally supplied to the British under Lend-Lease and transferred to the French in April, 1945.**

▶ New 75-mm. Skysweeper anti-aircraft rifle developed by Ordnance Department and now slated for procurement is last of the conventional anti-aircraft weapons, and is expected to be succeeded by ground-to-air missiles. The interim Skysweeper has an integral radar-directed fire control system and VT-fused ammunition, and tests have indicated it is capable of detecting and hitting planes at extreme altitudes and at supersonic speeds in day or night operations. Study now under way to combine USAF's Boeing GAPA missile project with a similar Ordnance missile project is expected to provide successor to Skysweeper.

▶ **Redesignation of the D version of the North American F-86 swept wing fighter as the F-95A is accompanied by reclassification of the plane as "interceptor" instead of all-purpose fighter. Modifications on the F-95A from the F-86 standard fighter version (AVIATION WEEK, Jan. 2) included lowering nose inlet duct to provide space for search radar in the nose, and addition of an afterburner for the GE J-47 turbojet, normally rated at 5200-lb. thrust.**

▶ Grounding order from USAF on all Republic F-84E Thunderjet fighters because of Allison J-35-A-17 engine problems, played hob with the combined Operation Portrex's air support in which many of the planes were to have been used. Allison reported troubles were traced to engine roughness resulting from bearing difficulties. Investigation of the bearing lubrication system was started and engineering recommendations were made to USAF to rectify the trouble.

▶ **USAF has set overhaul period at 225 hr. for the Pratt & Whitney R-4360 Wasp Major engine currently used in operational B-36 intercontinental bombers, with a customary limit of five overhauls before engine is retired from service. Overhaul period for the four GE J-47 turbojets now being installed in pods on the B-36s is set at 92 hr., while overhaul on the Allison J-35-A-17 turbojets powering the Republic F-84Es is set at 150 hr., with five to eight overhauls for the jet engines.**

▶ VASP Aerovias, Brazil, purchased six Swedish-built SAAB 90 Scandia transports last week for just under $2 million. Transports are powered with Pratt & Whitney's R-2180 engines developing 1650 hp. for takeoff. Planes are five production craft and the prototype, all in the non-pressurized cabin 33,600-lb. gross weight version. Sales were the first for SAAB in South America.

▶ **Kansas City gas turbine plant of Westinghouse Electric Corp. which began operations in January, is assembling jet engines from parts shipped in from Pittsburgh and from subcontractors, but will soon start fabrication of jet engine parts also. Westinghouse jet engine output was 50 percent greater in 1949 than in 1948, and considerable additional increase is expected in 1950 as a result of new Kansas City facility.**

▶ Navy has announced a new titanium alloy, including among other ingredients besides the basic light weight metal, 5 percent chromium and 3 percent aluminum. As previously reported in AVIATION WEEK, primary uses for titanium alloys are in gas turbine blades, tailpipe shrouds, engine firewalls and other jet engine applications, because of the advantages of the high strength-weight ratio, high corrosion resistance and ability to retain its basic properties at high temperatures. Its use in engines, Navy anticipates, will make possible not only greater engine powers, but improved range, payload and maneuverability because of lightness. The material also has the advantage of being available as ore in large quantities in the U. S. and Canada, thus becoming non-critical and non-strategic whenever it is produced in quantity.

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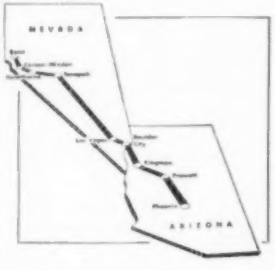

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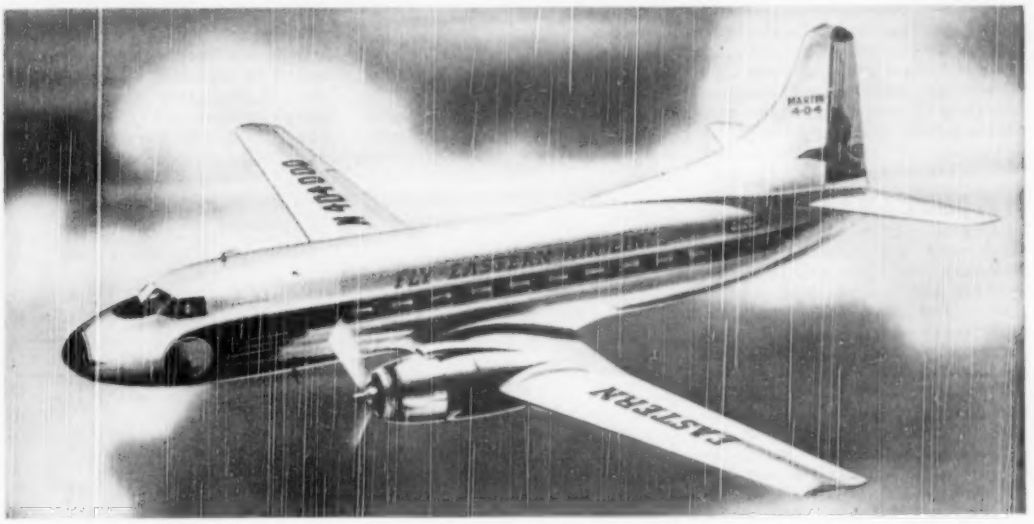


NEWEST TRANSPORT scheduled for widespread domestic use is the Martin 4-0-4 which looks like the 2-0-2, but with a longer nose.

Eastern and TWA Order 65 Martin 4-O-4s

By Alexander McSurely

Two major airlines, Eastern and TWA, last week agreed to buy a $35-million package containing 65 Martin 4-0-4 transport planes—35 for Eastern and 30 for TWA.

Details on financing were meager. But arrangements reportedly were being made whereby RFC was to supply most of the capital through the Martin Co. Both TWA and EAL were said to be ready to get bank credits if needed in preparation for down payments and further payments as planes are delivered.

Culmination of the largest U. S. twin-engine transport deal in three years followed months of engineering negotiations between the two airlines and the Glenn L. Martin Co. (first reported in AVIATION WEEK Dec. 19) which resulted in probably the most complete agreement on details of a new transport ever reached by two airlines.

▶ **Lease Deal**—Accompanying the major transaction for the pressurized cabin 4-0-4s is a leasing arrangement (AVIATION WEEK March 6) between TWA and Martin for 12 nearly-completed 36-passenger Martin 2-0-2 non-pressurized transports, predecessors of the 40-passenger 4-0-4s.

Delivery of the 4-0-4s is scheduled to start in the spring of 1951. Eastern's new airplanes will be certificated by CAA at 43,000 lb. gross while TWA's planes are expected to weigh in at a gross of around 42,750 lb. each.

▶ **Higher Gross**—The Martin company is starting immediately to get its remaining 2-0-2s also certificated at the 43,000-lb. gross weight, instead of the original 39,900-lb. figure for which they were originally approved, so that they can be leased to TWA at that weight. First of the leased planes is expected to be ready for TWA by the middle of the summer and all 12 by early fall. The extra weight allowance will be used for fuel or cargo since the seating plan is not expected to be altered.

Announcement confirming the transaction for the 4-0-4s came last week jointly from Capt. E. V. Rickenbacker, Eastern president, and Ralph S. Damon, Trans World Airline president.

C. C. Pearson, president of the Martin Co., is credited personally with much of the success of the final sale after a hard-fought battle between Martin and Convair.

▶ **Reverse Props**—Powerplants for the 4-0-4s will be two latest type Pratt & Whitney R-2800-CB-16 engines each delivering 2400 hp. with water injection, and turning Hamilton Standard reversible pitch and automatic feathering propellers. Eastern is reported to have made a special engineering study of reversible propellers and some recent technical difficulties with them before accepting the feature, which enables the airplanes to weigh in at a higher gross.

Announcement described the 4-0-4 as "the first production airliner designed for conversion to jet-engine-driven propellers," a statement which will presumably be argued by Convair, which has previously stated that its Convair-Liner was originally designed for turbo-prop conversion. (See accompanying story for additional details on late turbo-prop transport developments.)

▶ **Longer Fuselage**—The 4-0-4 is expected to pass its certification trials with relative ease since it is basically a slightly larger projection of the already proven Martin 2-0-2, with 39-in. longer fuselage to accommodate an extra row of four seats. Northwest Airlines has been operating 24 of the 2-0-2s for the last two years, establishing an excellent dependability record after the first difficulties almost invariably accompanying a new transport's introduction to service were solved.

To the Glenn L. Martin Co. the new contract came as a welcome substantial addition to relatively small military aircraft contracts, none currently for sizeable production. Other Martin business includes a special weapons program embracing rockets, missiles and electronic fire-control systems, a sub-contracting program for military aircraft component construction and some research and development contracts.

▶ **More Sales?**—Pearson said that the program spread over the next two years would be "important to the company's ability and readiness to accept further work from any or all of its customers. We are confident that the Martin 4-0-4's many points of superiority will be of great interest to other airlines which until now have not replaced their older twin-engine transport equipment and will result in further orders."

Price of around $540,000 apiece for the 4-0-4s with pressure cabins does not give the Martin company a large profit, industry engineers point out, and the company may do well to come out even on the transaction if additional airline purchases are not forthcoming. Pearson, and Glenn Martin, now in semi-retirement, and the RFC officials who have an interest in the Martin company, are anticipating that the low price for the pressurized craft will attract additional business from other companies, and probably later on from both Eastern and TWA, as they need additional twin-engine equipment replacements.

▶ **Source of Pride**—Pearson pointed out that acceptance of the airplane by "two of the most experienced and most highly regarded airlines in the world" was in itself a source of pride to his company.

▶ **Performance**—The new 4-0-4 is expected to be slightly improved over the 2-0-2 in speed, with a top speed of 312 mph. at cruising altitude (14,000 ft.) and a probable near-300-mph. cruising speed.

The Martin 2-0-2 quotes an unusually low stalling speed for a transport, certified at 76 mph. at aft CG. Presumably the new plane will have only slightly higher stalling speed due to the increased gross weight. This will still give the plane an advantage in using relatively short fields, as a DC-3 replacement. It is understood that the advantage in short field performance was one of the factors in selection of the Martin over the Convair.

▶ **Present Equipment**—The joint Martin equipment deal by Eastern and TWA is an interesting indication of continued standardization by the two airlines, following their previous choice of the Lockheed Constellation as their standard four-engine airliner. As of Jan. 1 TWA had 35 Constellations with additional 20 on order, while Eastern had 20 Constellations. At the same date Eastern was operating 51 Douglas DC-3s while TWA was operating 63 of the same type, giving some indication of a larger eventual twin-engine replacement market potential for these two airlines with the 4-0-4 than the original order alone.

▶ **Other Airlines**—Potential DC-3 replacement market among other U. S. airlines for 4-0-4s may include such companies as: United, Braniff, Chicago & Southern, Colonial, Delta and National, while Northwest might be interested in increasing the gross weight of its present 2-0-2 planes and possibly augmenting this fleet with additional Martin planes at some later time.

American, Continental, Mid-Continent, Northeast and Western all currently operating Convair-Liners, are not likely prospects to buy 4-0-4s, nor is Capital, which has ordered three Super DC-3s, the first installment in a larger order yet to come.

It is also likely that other airlines may show interest in a leasing or purchase of the 12 new 2-0-2s after TWA completes its use of them under leasing arrangement and turns them back for 4-0-4s.

BOEING TURBOPROP Stratofreighter, as a Boeing artist visions it.

Turboprop Transport Plans Jelling

Plane manufacturers are working on conversion of their present equipment to turboprop installations.

Prospects for development of U. S. turbine-propeller transports warmed up last week as more manufacturers made bids for recognition of their designs by potential military and airline customers.

Behind all the proposals and airline and military consideration of them however was an overall engineering trend of watchful waiting to see how the only turboprop engines now flying in this country, Allison's new T-38 2750-shaft-hp. turbine, make out in extended flight tests.

First flights of the double version (5500 hp.) of the T-38, the Allison T-40, in a four-engine installation in the Convair Navy XP5Y-1 flying boat, were expected "any day now" at San Diego. These and the later flights in the Allison-owned Convair-Liner, now being modified to receive two T-38 installations as a flying test bed, will answer many engineering questions which the airline and military customers want to know, before they commit any extensive turboprop programs to production.

Meanwhile several manufacturers last week indicated their turboprop transport designs are crystallizing for early development when more experience is available on the engines.

Reports were:

• **Boeing Airplane Co.** announced that installations of four Allison T-40 twin-turbine units are being developed as potential replacements for the four conventional Pratt & Whitney R-4360 Wasp Major engines powering the Boeing Stratocruiser and its military counterpart, the C-97A Stratofreighter.

• **Glenn L. Martin Co.** disclosed that the new 4-0-4 twin-engine transport which it will build for Eastern Airlines and TWA (see accompanying story in Headline News section) is designed for conversion to turboprop installations using the same Allison T-38 single turbine units which are being installed in the main competition to the new 4-0-4, the Convair-Liner.

• **Douglas Aircraft Co.** has made studies of application of turboprop powerplants both to the DC-6 and its later versions the DC-6A and DC-6B using the T-38

single turbine units. Also under consideration is a turbine-propeller version of the big C-124 military transport, which would use the double-turbine T-40 units.

• **Consolidated-Vultee** started work at San Diego on modification of the Allison Convair-Liner flying test bed and continued water taxi tests of what will presumably be the first multi-engine turboprop plane to fly in the U. S., the Navy XP5Y-1 search and anti-submarine warfare flying boat. Meanwhile Convair's Ft. Worth engineers discussed with the USAF design for a turboprop version of the B-36 intercontinental bomber with swept wings, designed for 500 mph. speed. (See story starting on page 14.)

Frederick R. Collins, Boeing vice president and sales manager, in announcing the turbine-propeller design version of the Stratocruiser and Stratofreighter said overall weight would be approximately 25 percent less than for the present piston engine installations, which would enable the plane to carry 1000 gal. additional of fuel, or its weight equivalent (6000 lb.). He estimated that modification of the Stratocruiser nacelles to take the smaller diameter double-turbine unit would be the major necessary changes in the airplane, since it was already highly stressed and designed for high speed operation. However additional changes lengthening fuselage would be recommended to increase cargo volume or passenger capacity. In such a revision, Collins estimates the double-deck Stratocruiser would "give frontline airline service for the next decade at least."

Martin's design study for conversion of the 4-0-4 to turboprop power, with the Allison T-38 unit, presumably was based partly on the comparable conversion of the Convair-Liner, and partly on the early turboprop transport design study which Martin prepared for United Airlines back in 1946, the Martin 3-0-4. This was to use the then promising General Electric TG-100 turboprop rated at 3200 shaft hp. later shelved by GE.

U.S. and Russian Air Power

(AVIATION WEEK Estimates)

	United States	Russia
Total plane strength	13,000	19,000
Strategic bomber strength	460*	350**
Annual production	50†	180
Fighter strength	4500	7500
Annual production	1300‡	1800‡
Tactical aircraft for ground support	400§	7500
Annual production	None	1000

* B-29s, plus 70 B-36s.
** B-29 types; possibly some improved types.
† B-36s
‡ Advanced jet types.
§ Assigned to USAF and Navy Reserve components.

Sen. Millard Tydings (D., Md.), chairman of the Senate Armed Services Committee reported on comparative land and sea power, as follows:

• **ARMY.** Russia has 100 battle-trained divisions for immediate use and 100 additional divisions which "can be quickly readied," compared with the U. S. total of 10 divisions.

• **NAVY.** Although "vastly superior," it is doubtful if the U. S. Navy could keep the sea lanes clear for transport operations in view of Russia's rapid advances in submarine development.

Cracks Showing in Defense Ceiling

Consideration of Russia's growing power and end of atom bomb monopoly weaken Johnson's economy stand.

Russia's growing military power may dictate a cracking of the Truman-Johnson arbitrary $13.5-billion-a-year ceiling on defense expenditures. Prospects are stronger for restoration of the weakened U. S. Air Force to a strength capable of challenging an atomic onslaught with intense defensive and offensive operations pending mobilization.

Washington officialdom, yearning for a "sound peacetime economy" under a balanced national budget—with $13.5 billion a year for defense, the country is running a $5 billion a year deficit—is reluctantly facing two unpleasant facts:

• **Russia's development** of the atomic bomb means that this country's best assurance against attack, its monopoly on a stockpile of the devastating weapons, has been removed—or will be in a few years as Russia goes into quantity production. Secretary of Defense Louis Johnson's confidence that this country can minimize its Army, Navy, and Air Force and still be assured against attack because of atomic superiority is being chipped away.

• **In all other categories** of armed strength the scales today are already tipped in Russia's favor. In a few years they will be overwhelmingly in Russia's favor, if the Administration sticks to the course it has charted, keeping defense expenditures scaled down to $13.5 billion a year, while Russia pursues an all-out armaments building program.

▶ **First Line**—Joint Chiefs of Staff strategic plan calls on USAF as initial defender to stave off an aggressor, with defensive and offensive operations. Gradual support would come from other elements, but USAF would be primarily relied upon to sustain the U. S. position during an 18-months mobilization period.

In testimony to the House Appropriations Subcommittee on the Armed Services, Air Force Secretary W. Stuart Symington presented this realistic picture of USAF's ability to meet an atomic aggression:

• "**The Air Force position** has always been . . . that a program of 70 groups or its equivalent is essential to the minimum peacetime security of the United States." Significantly, Symington added: "Under modern conditions even this number should be looked at. It may be low."

• **U. S. has 44 effective** groups and 4 obsolescent groups at present.

• **Under the Administration's** scaled-down program of $1.3 billion a year for aircraft procurement over the next five years, the USAF "will gradually deteriorate" to an effective 34 groups in 1954—the point at which it is anticipated Russia will have an atomic stockpile to give confidence of victory in war. The reduced procurement in the 1950 and 1951 fiscal years will start being reflected in reduced USAF strength, late in 1951. From that point, USAF strength, temporarily sustained at 48 groups by deliveries from procurement obligations entered into in the 1948-49 fiscal years, will dwindle rapidly.

• **To sustain the current** and inadequate 48 groups beyond late 1951, USAF's aircraft procurement allocation would have to be boosted from $1.3 billion to $2 billion a year.

Symington's testimony was one more bid to Johnson to stop sacrificing national defense on the altar of false economy and politics.

▶ **Pentagon Briefing**—After Symington stated in a public speech that Russia

now has "the world's largest army, largest air force and largest submarine fleet, and if they chose to mount a surprise atomic attack against any part of the United States . . . we have no sure defense against such an attack," Johnson summoned 22 senators—members of the Armed Services and Appropriations Committees—to a Pentagon "briefing session" at which the Joint Chiefs of Staff gave assurances that Johnson's cutback program was not imperiling the country.

Next, Johnson jumped the gun with an answer to Symington's testimony before the House Armed Services Appropriations Committee. The day before the scheduled release date of the Symington testimony, Johnson released a chapter out of his semi-annual report claiming that his cutback program was strengthening defense as well as saving expenditures. The semi-annual report, now at the printers, was not scheduled for public release for another two weeks.

Then, promptly following the release of the Symington testimony, Johnson called the 22 senators for another Pentagon "briefing session." At this session, in addition to defending his economy program, it is understood, Johnson also opened the door to a possible "necessity" for a substantial increase in the current USAF program, and supporting increases for Naval and Army programs.

► **Tydings on Step-up**—After the session, Sen. Millard Tydings, (D., Md.), chairman of the Senate Armed Services Committee, told AVIATION WEEK that a stepping up of the USAF program "hinges on several intangibles."

This is the over-all defense budget picture.

• **The State Department,** deeply concerned over the loss of international prestige resulting from Johnson's economy program, is pressuring for a strengthening of the armed services and a speed-up of the $1-billion European Arms Aid program planned for this year. $90 million of the program is earmarked for USAF and Naval aviation equipment.

• **Resistance in Congress** to an increase in the President's $13.5-billion military budget remains strong. Rep. George Mahon (D., Tex.), chairman of the House Appropriations Subcommittee, anticipates that his group will cut back the $13.5 billion even further. Sen. Elmer Thomas (D., Okla), chairman of the Senate Appropriations Subcommittee on the Armed Services, plans "to cut it down as much as possible." Mounting public concern over the national defense makes it doubtful that a cutback would be accepted in floor action, and indicates that some increase is more likely.

But disarmament and peace agreement talk is expected to divert attention from the deteriorating USAF for the next few months.

After the November elections, with political pressure for a balanced budget eased, the Administration may be ready for more realistic plans for a substantially increased USAF strength.

B-52 Deferred

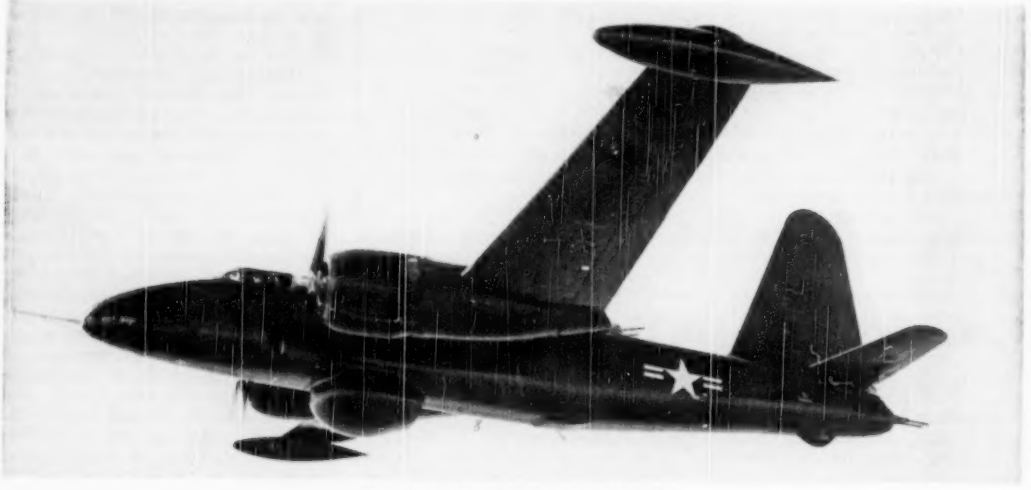
Air Force studies B-36 modifications; swept-wing turboprop is eyed.

USAF this week confirmed a report (AVIATION WEEK, Feb. 27) that it plans to defer production of the Boeing B-52. The scheduled successor to Convair's B-36 intercontinental "Big Stick" of the Strategic Air Command, the B-52 prototype is scheduled for flight test in 1952.

While Air Force officials admit only that "studies are being made to determine the extent to which the B-36 may logically be expected to develop with changes in design and power," fact is that engineering design studies for a swept-wing, turboprop version of the B-36 are already under scrutiny of USAF bomber design section.

Prime factor behind USAF decision to cancel B-52 production in favor of the B-36 is an Administration-forced economy. The B-36 now costs approximately $4.7 million each. Initial production of the B-52, preliminary cost estimates indicate, was set at $7.5 million—in addition to the costs of tooling up for quantity production. But swept-wing version of the B-36 can be produced with relatively minor tooling changes.

Secondary factor influencing Air Force in favor of the B-36 is the element of time. Joint Chiefs of Staff timetables call for a strategic (long-range)



SUB KILLER P2V-4 NEPTUNE

First in-flight photo of Navy's P2V-4 Neptune long-range all-weather, anti-submarine patrol bomber. Designed by Lockheed Aircraft Corp. for the Navy to meet snorkel-type sub threat, the craft carries radio sonobuoys to drop in a submarine suspect area. Buoy contains a microphone which is automatically lowered to a pre-set depth to pick up sound of submarine propellers and transmit them to the aircraft. The P2V-4 carries an ample arsenal of torpedoes, rockets, bombs, mines, machine guns and rapid-fire 20-mm. cannon to meet any situation it might encounter. Note radome beneath fuselage.

very heavy bomber force of six groups by June 1, 1954. Today we have only two fully equipped B-36 groups. A third is rapidly building towards completion and a fourth is scheduled for conversion early in 1951. The remaining two are scheduled for conversion from presently obsolete B-29 groups to B-36s by spring of 1954. This will provide JCS, which controls USAF's Strategic Air Command, with 180 B-36s—four all-purpose heavy bomb groups and two heavy reconnaissance bomb groups.

▶ **Consider Two Engines**—Development studies of the turboprop version of the B-36 (AVIATION WEEK, Mar. 14, 1949) first considered use of Allison double-turbine T-40 5500-hp. turboprop engines. Present planning indicates probable alternate use of 5000-hp. Pratt & Whitney turboprop engine currently under Navy development contract.

Prototype turboprop version with conventional wing configuration will be B-36F and is scheduled for flight test early next year. Swept-wing, turboprop version will likely be assigned an entirely new USAF designation.

▶ **B-36 Concept**—Decision of the joint chiefs to hold to the B-36 as sledgehammer of their strategic defense concept through Jan. 1, 1955, is present inability of current jet fighter craft to make significant percentage of successful attacks on the bomber. Key to present role of B-36 concept is its performance at 40,000 ft. and above and the subsequent shift in fighter-bomber battle into the tropopause, an area of the atmosphere that has not as yet been fully explored.

Present performance of the B-36 with full equipment and 10,000 lb. bomb load is reported officially as 372 mph. true air speed. Jet pods added to B-36D models have upped the speed to 436 mph. Sweep-back of the outer wing panels of the B-36 plus turboprop engine installation will up performance of the bomber to an expected 500 mph. This changes the present Mach limitation from .69 to .75. Eventual hope of USAF is to reach a 500-mph. speed at 55,000 feet.

▶ **Invulnerability**—The low wing-loading of the B-36 already makes it possible for it to out-maneuver the fighters which have a higher wing-loading. Fighter's margin between top speed and stalling speed is extremely narrow at 40,000 ft. and restricts them to shallow 15-degree turns.

Rate of climb of present jet fighter types to 40,000 ft. is not fast enough to allow them to intercept even the current B-36 before it reaches its target and drops bombs. Early warning radar gives less than 30 minutes warning of a B-36 approach while fighters take 36 minutes to reach 40,000 ft. Even on days when B-36 contrails are clearly visible from the ground, jet fighters have been unable to climb to 40,000 ft. in time to position themselves for an attack before the bomber made its drop.

STRIKERS PICKET American Airlines office at Chicago Airport after end of talks.

'Job Security' the Big Issue

American Airlines faced by union demand—reinforced by strike—that maintenance work be kept at home.

With less than half of its normal number of flights operating, and with losses piling up from a strike of its 4600 maintenance workers, American Airlines last week faced up to a tough problem that other major airlines will have to meet before the year is out.

Two of the issues at stake—wages and severance pay—looked like they could be compromised without great strain. The third issue was the big one. The union (Transport Workers Union, CIO) calls it "job security," and it is a prime worry of all airline ground employes. But airlines call it something like "management policy."

▶ **Everybody squeezed**—In a nutshell, here's what it's all about: Job security in the strike is affected by four things:

- **Subcontracting** of maintenance work to outside contractors or other airlines.
- **Interline agreements** providing for one airline to do maintenance work on planes of another airline. Several such agreements already are in effect.
- **Technological improvements** which cut down amount of maintenance and overhaul necessary. Also, larger but fewer, planes might affect this.
- **Moving of bases** or maintenance work, such as Pan American Airways' current shift of much of its Constellation work from LaGuardia Field to London.

The workers, of course, are caught in the familiar squeeze of overhead vs. economical, efficient operation. But airline management in this situation also is being squeezed on many fronts.

There is the Civil Aeronautics Board which publicly espouses interchange agreements and mergers. There is the terrific capital investment involved in setting up to do all maintenance. There is (in the PanAm case, for instance) the time, distance and money involved in ferrying planes on European routes back to the U. S., and the foreign currencies to PanAm's credit abroad.

▶ **Old Issue**—Job security is not a new question in airline negotiations with ground workers. But because the points listed have become a greater irritant to the union in the past year, TWU this time gives every indication of standing firm. Job security is a major issue in current TWU negotiations with PAA, and in Northwest Airlines' dickering with its union of ground employes.

The union's campaign against subcontracting has an element of irony. For several years, independent overhaul firms have been promoting "pooled maintenance and overhaul." The airlines were not too interested, preferring their own maintenance facilities. But complex aircraft such as the Boeing

Stratocruiser, some parts of which require highly specialized knowledge, have pushed an increasing amount of work to the outside firms.

In the American strike, the company to a certain degree recognized the union's job security plea. In trying to compromise the severance issue, American pointed out that obligation to pay severance would penalize the company if it subcontracted to such an extent that its own work force could be cut.

▶ **To Mediation**—At mid-week, this was the situation. With the strike one week old, American was operating about 50 of its usual 189 daily flights. It had added 10 flights since the curtailment on the first day of the strike and was serving 37 of its 68 points. (The union claimed the company's figures did not give a true picture; AA was operating short flights, it said, to make the number look impressive.)

The National Mediation Board had asked the employes to return to work pending mediation of the dispute. Meeting early last week in cities along AA's system, the workers overwhelmingly voted down the back-to-work proposal. Nevertheless, company and union officials went to Washington to meet separately with NMB officials to find a basis for settlement.

▶ **Starting Over**—Despite the fact that agreement had been near before the strike began, the union took the position that all bets were off when the strike was on. Job of the Mediation Board was to start all over with company and union on these issues (in addition to job security):

• **Wage increase** of 20 cents an hour across the board. AA now pays mechanics, senior mechanics, lead mechanics and inspectors from $1.58 to $2.14 an hour, with a minimum wage of $1.02 an hour for plane cleaners and parts washers.

• **Three weeks paid vacation** after ten years. Company would like to make it after 14 years.

• **Severance pay** after one year's employment. Company wants severance to begin after three years' employment.

• **Term of contract.** Union would like a one-year contract, company a two-year term. But both previously agreed to an 18-month period, and it may turn out like that again.

RTCA Meeting

Radio Technical Commission for Aeronautics is planning a 1950 spring assembly March 30-31 in Washington, D. C., on the SC-31 transition system. The public meeting will feature a "down to earth" discussion of where the program stands today in relation to pilot, operations man and engineer.

A tentative list of two dozen speakers has been prepared, including representatives of manufacturing, government and operating groups.

ICAO Standards

Member nations of the International Civil Aviation Organization this month agreed in substance to standardization of customs, immigration and related procedures which will speed the international movement of passengers and cargo by air. The model procedures are contained in an annex to the convention on International Civil Aviation which has been under development and study by ICAO for several years.

Issue Transport Copter Safety Rules

New operating rules which will permit federal agencies to keep close tab on helicopters used in air transportation of passengers, cargo and mail have been drawn up by the Civil Aeronautics Board's Bureau of Safety Regulation.

Contained in a proposed new Part 46 of the Civil Air Regulations, the rules would apply to carriers using the rotary-wing craft either in scheduled or non-scheduled service. Object is to provide a level of safety for helicopter operations which will be the equivalent of that required for operators using fixed-wing aircraft.

▶ **Comments Invited**—Interested parties are invited to submit written comments on the proposal to CAB by Apr. 15.

Part 46 would require an air carrier to use helicopters which have been certificated and identified in accordance with applicable airworthiness standards and which have been found by the Civil Aeronautics Administrator to be safe for the service offered. The Administrator will be permitted to examine all helicopters to determine if they are equipped and maintained under required standards.

An administrative means for limiting transient use of helicopters will be included so that CAA can be assured that satisfactory maintenance and training is

TOP RESEARCH TALENT ALL IN ONE PLACE

A recent executive committee meeting of the National Advisory Committee for Aeronautics at Ames Aeronautical Laboratory, Moffett Field, Calif., produced one unlooked-for result: A group picture of most of the country's leading aeronautical research talent.

First row, left to right: J. A. White, Ames Laboratory; Smith J. DeFrance, director, Ames Laboratory; John F. Victory, executive secretary, NACA; Major General Gordon Saville, deputy chief of staff, development, USAF; Vice Adm John D. Price, vice chief of naval operations; Dr. W. F. Durand, former member and World War I NACA chairman; Dr. Jerome C. Hunsaker, NACA chairman; Dr. James H. Doolittle, vice president, Shell-Union Oil Corp; Rear Adm. Theodore C. Lonnquest, deputy and assistant chief, Navy Bureau of Aeronautics; Catherine Wheeler, NACA headquarters; Dr. Edward U. Condon, director, National Bureau of Standards.

Second row, left to right: A. G. Buck, Ames Laboratory; Carlton Bioletti, Ames Laboratory; J. F. Parsons, Ames Laboratory; R. G. Robinson, Ames Laboratory; John W. Crowley, NACA headquarters; Dr. Hugh L. Dryden, director, NACA; Dr. A. E. Raymond, vice-president-engineering, Douglas Aircraft Co.; Dr. T. P. Wright, vice president for research, Cornell University; R. M. Hazen, director of engineering, Allison division of General Motors; John R. Alison, former NACA member and former assistant secretary of Commerce for Aeronautics.

Back row, left to right: A. B. Freeman, Ames Laboratory; H. J. Goett, Ames Laboratory; E. W. Betts, Ames Laboratory; H. A. Wilson, Langley Aeronautical Laboratory.

Also Dr. H. J. E. Reid, director, Langley Laboratory; M. J. Hood, Ames Laboratory; Captain W. W. Diehl, Navy Bureau of Aeronautics; Dr. E. B. Sharp, director, Lewis Flight Propulsion Laboratory; D. H. Wood, Ames Laboratory; Captain J. T. Howard, Naval Air Station, Moffett Field; Carl Koplan, Lewis Laboratory; M. B. Ames, NACA headquarters; F. L. Thompson, Langley Laboratory; John Stack, Langley Laboratory; J. H. Abbott, NACA headquarters; J. C. Evvard, Lewis Laboartory; H. Julian Allen, Ames Laboratory.

provided by the carrier. Each helicopter would be required to be equipped with specified instruments and equipment acceptable to the Administrator for day and night operations.

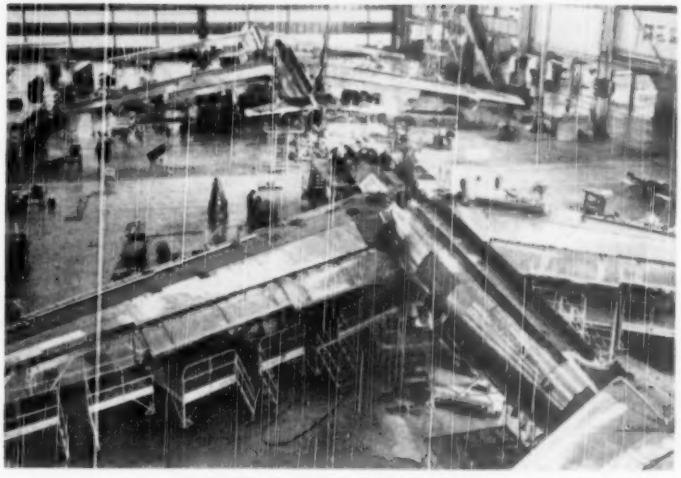
▶**Operating Limits**—The carrier would provide a cockpit check list for each type of helicopter. In addition, no helicopter could be used unless it met such operating limitations as CAA determined would provide a safe relation between the aircraft, the heliport to be used and the areas to be traversed.

Proposed Part 46 contains provisions for preparation and maintenance by the air carriers of operations and maintenance manuals for the guidance of personnel. Facilities necessary for inspection, maintenance, overhaul and repair of the type helicopter used would be maintained by the carrier unless arrangements acceptable with CAA are made with other persons possessing proper facilities.

▶**Certificates Required**—Pilots used in scheduled helicopter transportation will be required to hold helicopter airline transport pilot certificate. CAB plans to revise Part 21 of the Civil Air Regulations (which established certification requirements for regular airline transport pilots) to provide for a separate helicopter pilot's certificate. Pilots used in irregular helicopter services will be required to hold at least a commercial pilot certificate with an appropriate rating.

Helicopter pilots in air transportation will be required to demonstrate their proficiency at least twice a year. They will not be permitted to pilot helicopters more than 5 hr. in any consecutive 24 hr., nor more than 85 hr. per month.

All helicopters used in scheduled operations will be required to have individual approval from the Civil Aeronautics Administrator.



FIRST WICHITA-BUILT B-47

First production Boeing B-47A Stratojet bomber rolls from Wichita plant (top)—completed less than 18 months after Boeing received Air Force procurement "letter of intent." Inside the plant, three of the first five bombers, being hand-tooled while the plant tools up for major production, near completion. Following flight tests, planes are scheduled for delivery to 301st Bomb Group, Barksdale AFB, La., headquarters of SAC's Strategic Reconnaissance. Externally, swept-wing B-47A remains similar to the two original "X" versions. Major internal changes were made, however, including installation of six GE J-47 engines rated at 5200-lb. thrust instead of former J-35s developing 4000-lb. thrust; and an increase in fuel capacity. Wing span is approximately 116 ft.; length, 108 ft.; height, 28 ft. Gross weight at takeoff is 150,000 lb. It is equipped with 18 RATO units developing an additional 20,000-lb. thrust. Combat radius is over 1000 miles, service ceiling over 40,000 ft.; and bomb capacity ten tons. Fifteen B-47 Stratojets were ordered from fiscal '49 funds.

High-Intensity Light Dispute Settled

A long-standing dispute between the Civil Aeronautics Administration and the Welsbach Corp., Philadelphia, over royalty fees for installation of high intensity runway lights has been ironed out.

CAA Administrator D. W. Rentzel said a new agreement provides for paying Welsbach Corp. and Bartow Beacons, Inc., a royalty fee of 26 cents a linear foot for the high-intensity lights. The Welsbach Corp., which administers the Bartow Patents for high-intensity runway lights, originally requested a royalty fee of 80 cents a runway foot.

CAA balked at the higher figure and last May issued a stop order on federal participation in the cost of high-intensity runway lights under the Federal Airport Act. With the new agreement, this ban was lifted on March 1.

The settlement defines high-intensity runway lights as those emitting a light of more than 10,000 candlepower without color correction.

Navy Contracts

Four and one-quarter million dollars for propellers and spare propeller blades from United Aircraft Corp., Hamilton Standard division, leads the list of recent Navy aviation contract awards. Others:

Union Oil Co. of Calif.—1,000,000 gal. of aircraft engine fuel, $91,000; Ford Instrument Co., division of the Sperry Corp.—2 computers and spare parts, $538,500; Picker X-ray Corp.—mobile X-ray photographic and fluorographic unit, $63,568; Tumpane Co.—services to process 1200 machine tools, $138,863.68; Fairbanks, Morse & Co.—66 sets blower conversion parts and 6 tools, $50,000; Electric Storage Battery Co.—3 sets submarine main storage battery elements, $600,000; National Battery Co.—6 sets submarine main storage battery elements, $1,000,000 (approx.).

Westinghouse Electric Corp.—three propulsion control cubicles, $50,000; Emerson Electric Co.—93 modification kits to convert installation and spare aircraft tail turrets, Aero 11A to Aero 11A-1, $53,842; Jack & Heintz Precision Industries—362 inverters, $277,220; General Electric Co.—one turbine generator set, $50,000.

SALES & SERVICE

Two Major Distributors Combine

Air Associates buys Snyder Aircraft. Result: More outlets and expanded line of products.

With many distributors and dealers in aviation supplies feeling the effects of the declining personal plane market, two of the nation's largest distributors last week combined forces for a reinvigorated sales drive.

Air Associates, Inc., with headquarters in Teterboro, N. J., and branches throughout the country, bought Snyder Aircraft Corp., based at Chicago, with branches at Denver and Columbus, Ohio. Combined volume of the two last years was more than $7 million.

The Chicago firm now will be operated as the Snyder Aircraft division of Air Associates, with Ray Snyder as its general manager and Russell Fick, Air Associates Chicago branch manager as executive assistant. The deal gives Air Associates two new outlets, increased facilities at Chicago (Air Associates already had a branch there), and an expanded line of supplies.

▶ **Stock Trade**—The deal consisted of trading 16,408 shares of Air Associates common stock at a book value of $21.79 per share to Snyder stockholders in return for that company's assets. Book value of the transferred shares is about equal in value to the net worth of the Snyder company.

In the fiscal year ended Sept. 30, 1949, Air Associates had net sales of $6,608,276. In the first quarter of its current fiscal year (ending Dec. 31, 1949), Air Associates sales fell off to $1,420,572 (due to temporary curtailment of military contract-letting), compared to $1,487,240 for the same period of time in the preceding year.

Air Associates says its sales over the past six months have shown an upward curve.

▶ **Market Decline**—That has not been a common experience among aviation distributors.

Many of them built their business on serving the personal plane owner. The lightplane slump has pinched. Another factor has been design changes. One easy-to-see example is the airplane fabric and finishes line.

Increasing number of all-metal aircraft played havoc with dealers in dope and other preservatives. This situation has been corrected to some extent by stocking lines of cleaners. But many sore spots in the distributor-dealer picture remain.

▶ **Air Associates Gains**—As a result of the new acquisition, the Teterboro company assumes control of a business having gross sales unofficially estimated to be approximately $1 milion yearly, and with branches at Denver, Colo., and Sullivant Ave. Airport, Columbus, Ohio.

The Snyder Aircraft organization has 50 employes, with 44 at Chicago and three each at the branches. The main installation, at Chicago Municipal Airport, across the street from Air Associates, consists of a 100-ft. by 115-ft. structure having about 16,000 sq. ft. of space on the first floor. Snyder's Omaha outlet was sold, prior to this transaction.

These new additions materially increase Air Associate sales outlets now located at Teterboro, Chicago, Glendale, Dallas, and the company's latest branch at Miami, with sales representatives at Seattle, Wichita and Washington, D. C.

They may point up the company's intentions to keep its distribution business in line with its recently emphasized production setup.

NEW TWIST IN CROSS-WIND LANDING

Auster's Autocraft, equipped with Goodyear cross-wind landing gear, comes in for a landing, piloted by the company's chief test pilot, Squadron Leader Forteus. Self-aligning wheels allow the Autocraft to be taken off and landed at single landing strips in England, and virtually eliminate danger of making a ground loop after landing out of the wind. Wheels can be used up to 40 deg. drift.

BRIEFING FOR DEALERS AND DISTRIBUTORS

▶ **PLANE DELIVERY**—Ferry Service Co. has completely reorganized at Lock Haven, Pa., for handling insured deliveries of all types aircraft to all parts of the U. S. or Europe accessible by land or float planes. The concern formerly operated from Detroit, Mich., but since acquisition of Stinson by Piper has moved to the new location under different management. The company has a record of delivering nearly 4000 planes from factory to domestic and foreign buyers since its start in 1945.

▶ **LIGHTPLANE COST ANALYSIS**—Booklet entitled, "Light Airplane Operating Costs," based on recent experience with 32 school-owned planes of various makes, has been prepared by Institute of Aviation, University of Illinois (Urbana).

▶ **AIRPORT MANAGER CHANGE**—South Carolina State Aeronautics Commission has announced that it has voted to "dispense with the services" of Dexter C. Martin as director and has named O. L. Andrews acting director. Andrews is manager of Greenville Municipal Airport.

▶ **STRETCHING GLIDE**—Beech Aircraft recently put out a bulletin to owners of Bonanzas, showing the best techniques for use in stretching a glide and for maximum range and maximum minutes aloft per gallon of fuel, in emergency use. It is possible to attain from 22 to 28 mi. per gal. and fuel consumption as low as 4.2 to 5.4 gallons per hr. by using these emergency procedures, which are for use only on the principle that it is reasonable to disregard damage that may result to engine and propeller, if such disregard will prevent injury to the pilot and the airplane.

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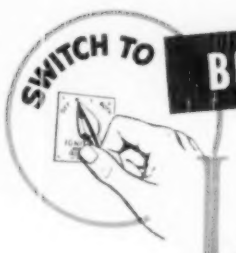

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Analysis of Ceramics for Jet Engine Use

Results obtained from research show strong and weak points.

Why Ceramics Are Important . . .

Perfection of high temperature materials for turbojet applications has been one of the major considerations in the development of this high-speed-regime engine.

Along with studies of metals, the investigation of ceramics has been a vital phase of the extensive research to create powerplant components affording greater reliability and longer life.

The data presented here analyze many of the factors which affect the use of ceramics and point up the growing need for closer liason between gas turbine engineers and ceramists.

Not everyone has the same conception of the ceramic field. Some sort of definition is in order. The nature of the materials being investigated under the label of ceramic research causes the adoption of the broadest limits.

The field of ceramics embraces all that is not clearly organic or metallurgical. There are the old, conventional silicate-based materials, which are composed of, or bonded internally with, glass. Of primary interest in gas turbine work are less conventional materials which do not contain glass.

Many of the glass-free materials have, as primary constituents, one or more of the refractory oxides, carbides, borides, nitrides and the like. Others are composed essentially of carbon or graphite. In addition, the field includes materials composed of various combinations of metal and inorganic compounds.

► **Distinctions**—Since ceramics is one of man's oldest activities, the question is often asked: "Then why is there such a paucity of information on many of the compositions of interest?"

The answer lies in the fact that few, if any, of the historic ceramic materials are remotely capable of meeting the temperature requirements peculiar to propulsion means for high-performance aircraft and guided missiles.

Prior to this recent interest in ceramics, the applications for these materials did not involve designs where shape and dimensions were so critical, nor conditions of stress and temperature nearly so severe.

To illustrate the marked differences in past and present demands for ceramics, the contrast between service conditions for sparkplug insulators, wall tile, refractory brick or metallurgical crucibles on the one hand and those for gas turbine rotor blades on the other might be considered representative.

Obviously, the ceramic materials available at the time research on gas turbine application was begun were simply not adaptable for the new uses. Unfortunately, the adjustments needed to improve their likelihood of success rarely were simple ones. Much research was necessary. The need for this research, in many instances, had to do with the nature of the internal structure of the materials.

► **Glass Action**—Conventional ceramic materials are characterized by the presence of a glass phase. It so happens that glass has notably poor resistance to thermal shock and tends to soften and deform under stress at relatively low temperatures.

Even if a ceramic material is almost wholly crystalline and contains glass only as a contaminant, the glass phase may interfere with the continuity of the crystal phase and serve as a "lubricant" under stress at high temperature.

We need consider no further to conclude that the glass phase can hardly be tolerated in structural parts for the hot zones of gas turbines.

But the removal of this distinguishing feature from a ceramic material is involved. It is not merely a case of omitting certain glass-producing compounds from a formula.

► **Clay Function**—Elimination of glass from the final product necessitates the exclusion of silicates from the raw materials.

This means that clay, among other raw materials, cannot be used.

It is well known that ceramists utilize the plastic properties of clay in forming articles. After forming, the clay bonds the nonplastic particles, so that the shape has sufficient strength for necessary handling, until it is fired. Further, during firing, the clay enters into thermochemical reactions which develop the fired or glass bond. Properties of the final article depend largely on the nature and extent of these reactions.

Briefly, then, clay has a large role in each major step of the fabrication process, and it is little wonder that trouble results from eliminating glass at the expense of this ingredient.

This background indicates that general progress in ceramics for gas turbines is manifested by advances in refractory materials free from the influence of a glass phase. Research on glass-free refractory materials can be divided conveniently into three main phases—raw material selection, forming and heat treating.

► **Material Studies**—Initial selection of raw materials is based primarily on melting point, stability and availability. In glass-free ceramics, where silicates must be excluded as raw materials, the supply still greatly exceeds present research demands. This favorable situation probably will persist for a long time. Investigators are continuously uncovering additional refractory compounds of interest, and it is a quite lengthy procedure to develop an optimum body of a selected composition.

From the standpoint of raw material selection, investigations pertinent to gas turbines have been rather thorough on most of the refractory oxides singly and on many combinations of oxides. But there is room for much more research, however, in connection with combinations of oxides.

With few exceptions, the development of bodies from other likely raw materials has been preliminary in nature, or has not been undertaken. The exceptions mainly involve some com-

Based on a paper by W. H. Duckworth and T. E. Campbell, assistant supervisors, Battelle Memorial Institute, before the 1949 Annual Meeting, American Society of Mechanical Engineers, New York, Nov. 28-Dec. 2, 1949.

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binations of oxides and metals, oxides and carbides, and development stemming from the background on carbide cutting tools.

In the latter category, the development and evaluation of mixtures of titanium carbide and cobalt for rotor blades is well advanced.

In general, the surface has only been scratched in the detailed development of bodies of refractory carbides, nitrides, borides, silicides and the like, singly, in combination with each other, or combined with metals.

It is not surprising that the oxides have received more attention than the other raw materials. They are more available or more easily prepared, and, of course, more stable in the oxidizing atmosphere encountered in service.

▶ **Forming**—After selection of the raw materials, the next major problem is to form them into some desired shape. The raw materials for forming normally consist of fine, nonplastic powders. The use of various organic compounds with these powders, as bonds and plasticizing agents, apparently has progressed to a point where they are commensurate with clay for ceramic forming.

It is no longer much of a problem to use any of the conventional ceramic forming techniques of dust pressing, plastic extrusion or slip casting in the fabrication of shapes of such mixtures. Also, it is often possible to produce these shapes to have sufficient strength for machining readily while in the green, unfired state.

Finally, after appropriate curing or drying, the formed shape is subjected to a heat treatment or sinter. The changes occurring in the internal structure during sintering determine the properties of the product.

The mechanism of sintering is not fully understood at present and the action is influenced greatly by several factors. For these reasons, the development of bodies is hindered most in this phase of research.

▶ **Difficulties Encountered**—An extensive amount of service tests on both oxide and metal-bonded titanium carbide bodies at temperatures above those presently used with alloy blades reveal certain problems in the use of ceramic bodies in turbine rotors.

There were stress concentrations between wheel and blade when the ceramic blades were substituted directly in present metal designs.

Severe thermal shock, resulting from failure of the air supply, caused blade fracture, and mechanical shock problems were also encountered.

It is interesting to note that each shortcoming of the ceramic blades in these service tests is traceable to a lack of ductility in the bodies. If a ductile body exists, we are unaware of it. Also, the possibilities of developing such a body seem remote.

Hence, if ceramic bodies are to attain their rightful place in turbojet technology, the gas turbine engineers must cooperate by designing machinery which more adequately accommodates these apparently inherent shortcomings in ceramics.

This lack of ductility in ceramics means that mechanical shock and stress concentrations are expected to present critical problems. Accompanying the brittleness, some of the bodies also have serious thermal stress limitations.

Maximum performance from ceramic bodies as rotor blades, therefore, depends on design and operational adjustments to counteract this brittleness. These adjustments, for the most part, involve problems in gas turbine engineering.

▶ **Engineering Cooperation**—Evaluations based solely on property determinations shed little light on the influence of lack of ductility on service performance. For example, thermal shock requirements for a given use cannot, at present, be related to the thermal shock properties of a material. The requirements depend on design as well as time-temperature relationships and the properties appear to depend on the magnitude of several other physical properties at the time of failure.

Some sort of simulated service test, therefore, is required for adequate appraisals, and the need for strictly gas turbine engineering is apparent here.

There is another consideration where cooperation between ceramists and gas turbine engineers might be beneficial. Ceramic bodies are inherently stronger in compression than in tension, as well as inherently brittle. Compressive strengths of some of the oxide bodies are of the order of ten times their tensile strengths.

This, of course, indicates that the best design would have ceramic rotor blades either prestressed in compression, or subjected to compressive loads.

If suitable designs could be evolved, prestressing offers possibilities of reducing thermal and mechanical shock problems, as failures from such shocks probably are tensile in nature.

If, on the other hand, the blades are subjected to compressive loads, porous bodies might be used. These bodies have lower strengths but better shock resistance than similar dense bodies.

▶ **Stator Blade Data**—With their lower mechanical requirements, stator blades offer a somewhat more likely future for ceramic bodies than rotor blades.

Ceramic stator blades, made from bodies too weak for rotor blades, but with good thermal shock resistance, might be satisfactory.

Even without higher operating tem-

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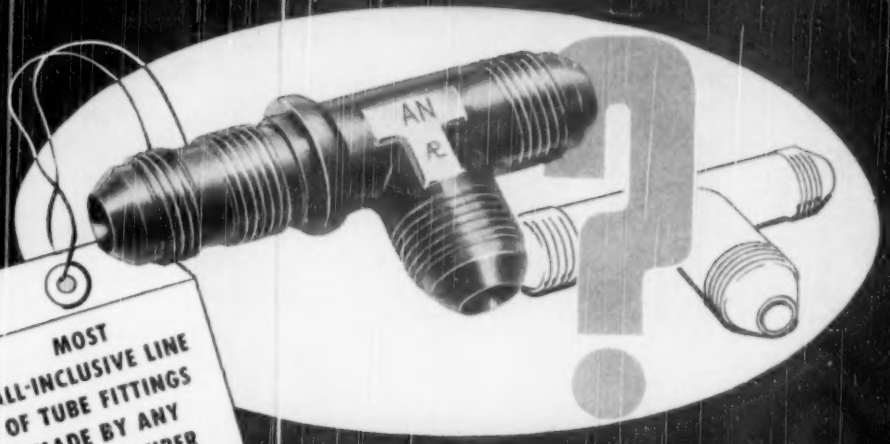

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peratures, it is possible that such blades would reduce weight and cost if used to replace metal blades in present designs.

As in the case of rotor blades, physical properties cannot, at present, be related to service requirements in a manner suitable for precise theoretical appraisals. However, as approximations, we could consider a few possibilities.

Bodies, able to withstand the thermal shock by virtue of being porous, might exist which are strong enough. There is sufficient background on oxides, such as magnesia, alumina or zirconia, and on zircon for their quick evaluation as primary constituents of such bodies.

Because of the considerable progress in ceramic research on protecting graphite bodies against oxidation, these also are possibilities. Certainly they would resist the thermal shock and, perhaps, the corrosion and mechanical stress.

Although limited in temperature resistance, fused silica and cordierite bodies should warrant detailed evaluation because of their low thermal expansion, resulting in good resistance to thermal shock. They might be satisfactory for present operating temperatures.

High conductivity bodies, such as those of silicon carbide or titanium carbide, also have good shock resistance and may work.

► **Liners, Coatings**—Ductility undoubtedly is necessary in the combustion chamber liners of present designs, thus eliminating the direct substitution of ceramic bodies for the sheet metal.

There are indications that metal-supported ceramic liners will withstand the conditions of service.

Also, ceramic bodies might be used to insulate combustion chambers if the need becomes sufficiently acute to justify design changes. Considerable success has been had in so insulating much hotter rocket chambers.

In addition to the work on ceramic bodies, a large portion of the ceramic research pertinent to gas turbines is directed towards developing and evaluating refractory ceramic coatings.

Such coatings seem particularly attractive for immediate use. They are not expected to afford outstanding benefits, but they are likely to extend significantly the usefulness of alloys and few, if any, design changes are anticipated in order to use them.

Primary purpose of the coatings, presumably, is to seal the metal surface against corrosive attack and, secondarily, to provide thermal insulation. Not much can be expected from them as insulators, since they must be thin to be tough and adherent.

► **Coating Types**—Most of the work on coatings has been confined to the enamel types. These consist essentially of a thin layer of glass and, as such, are

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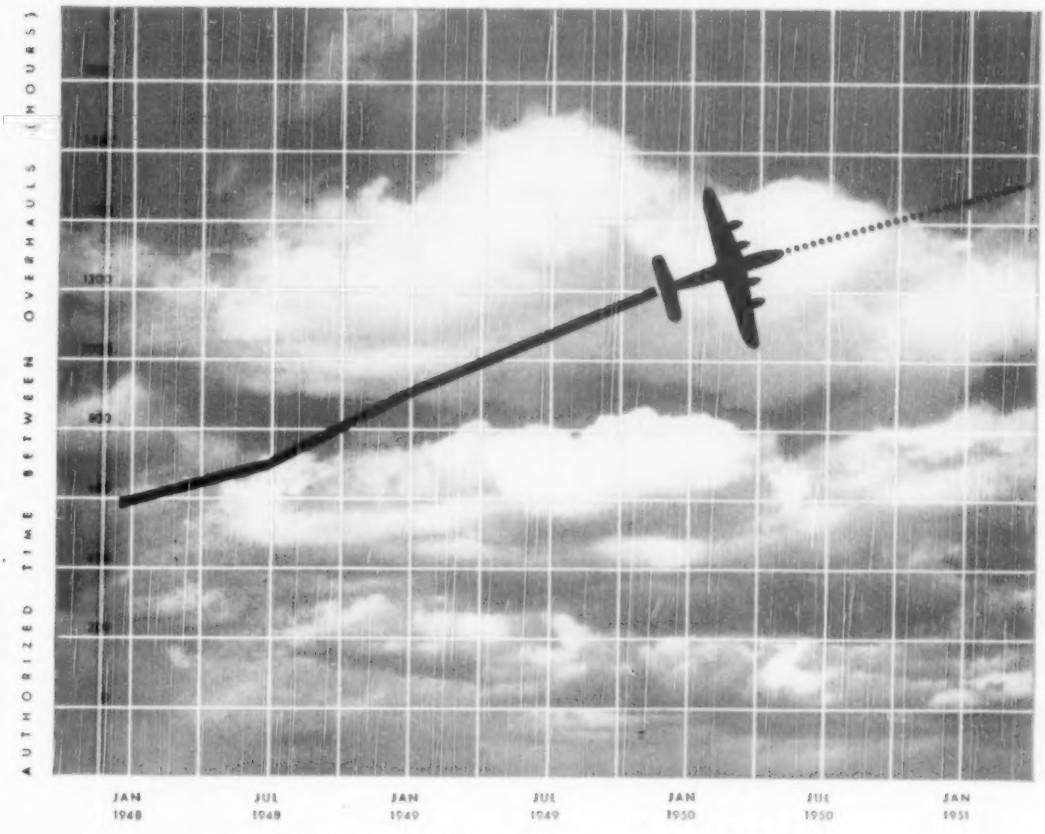


More flight hours . . . more profitable airline operation . . . are end results of this sharp upward trend in the authorized time between overhauls of Cyclone engines.

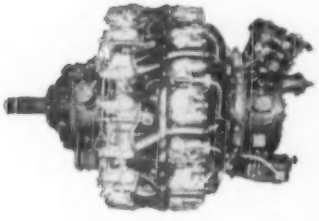
Wright Cyclone 18BD on the Lockheed Constellation saves hundreds of overhaul and spark-plug-change hours.

● NEWS OF THE MONTH is the endurance record of the Wright Cyclone 18BD on the Lockheed Constellation . . . despite the short time it has been in production for airline service.

● **In the brief span of two years, this 2500 horsepower aircraft engine has extended authorized time between overhauls from 600 hours to 1200 hours in fleet operation.**

● In addition to this outstanding performance record, a nearly 70% improvement — from 300 to 500 hours — has been effected in the authorized spark plug change time.

● Such records reflect the sound engineering design and built-in durability typical of Wright Cyclone engines . . . characteristics that have produced these gains in authorized overhaul time . . . corresponding reductions in overhaul costs . . . and customer-satisfying schedule reliability.



POWER FOR AIR PROGRESS

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BRANIFF International AIRWAYS
November 12, 1949
Surface Combustion Corporation
2375 Dorr Street
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Attention: Mr. James V. Ashby, Sales Manager
Gentlemen:
Braniff International Airways experience with "Janitrol" Surface Combustion heaters on DC-6 and DC-4 airliners, flying from Chicago to Rio de Janeiro, Brazil, under varying weather conditions, has been very good. Owing to this very satisfactory operation, we are now installing your heaters on all of our DC-4 planes.
During the first nine months of this year, in more than 11,000 hours of DC-4 flight service, we enjoyed a very satisfactory performance from "Janitrol" heaters. As we have three heaters per plane, this record covers 40,000 heater hours of operation that has been practically trouble-free.
"Janitrol" heaters on our DC-6 (El Conquistador) planes have also performed satisfactorily. Braniff has had no major troubles with DC-6 cabin heaters in over 5,000 hours this year. The wing and tail anti-icing heaters also showed the same fine record.
The record of "Janitrol" heating units on Braniff Airways planes in all the more remarkable when you consider the varied conditions under which our planes operate. From Chicago to the Houston, Texas Air Gateway between the Americas, we serve Tri-Cities, Burlington, Kansas City, Topeka, Wichita, Ponca City, Oklahoma City, Tulsa, Dallas and Fort Worth. From Denver to Memphis, we serve Colorado Springs, Pueblo, Amarillo, Lubbock, Okmulgee, Fort Smith and Little Rock. These routes cover some 3,700 miles.
Braniff's El Conquistador (DC-6) and El International (DC-4) planes serve six Latin American countries: Cuba, Panama, Ecuador, Peru, Bolivia and Brazil. "Janitrol" heaters must warm cabins at the highest airports in the world* (13,358 feet) at La Paz, Bolivia, and on the nonstop 2,240-mile non-stop hop over the lofty Andes, between Lima, Peru and Rio.
There is nothing finer, nothing faster between the Americas than Braniff Airways' airliners. And we think there is nothing finer than "Janitrol" heaters that contribute so much to Braniff's operations.
Yours very truly,
BRANIFF AIRWAYS, INC.
W. Warfield
W. Warfield
Director of Maintenance & Engineering
Mtnl
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"nothing finer"

Take 28 seconds and read the above letter. It's worth it, for it forges another strong link in the long chain of "final evidence" that Janitrol aircraft heaters do the jobs they're built for—dependably, and more often than not, well beyond normal expectancy . . . Specific, practical help on your aircraft heating problems—military or commercial—from design through field service—is *yours to command* from your nearest Janitrol representative whose name appears below. Call him. He can help you most in the preliminary design stage of your aircraft.

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subject to yielding under stress at relatively low temperature.

We are not so concerned with this weakness in coatings as in bodies because the base metal, not the coating, bears the stress. In laboratory tests, coated specimens have been unaffected under conditions of time, temperature and atmosphere which completely deteriorated uncoated specimens.

Another development has produced spall- and oxidation-resistant coatings of metal-ceramic combinations. Some of these appear to be more heat-resistant than the enamel-type coatings and more techniques have been developed for their application.

▶ **Deposition Process**—Most generally useful methods developed for the formation of refractory coating involve the so-called "vapor-deposition" process in which the coating is formed by chemical reaction at the heated surface of the base metal. Volatile compounds containing the coating elements are passed over the work, heated to a temperature at which the components of the plating atmosphere react to form the desired coating.

Examples of processes for the formation of refractory coatings include the deposition of metals such as tantalum, molybdenum and tungsten by hydrogen-reduction or thermal decomposition of their chlorides or bromides; the formation of coatings of silicon carbide, titanium carbide, tantalum carbide, etc., by the reaction of their chlorides in a hydrocarbon-hydrogen atmosphere with a refractory metal base.

Perhaps the most outstanding development of vapor-deposition processes is the development of protective coatings for molybdenum, that have permitted its use in air for over 5000 hr. at 1800 F and as long as 200 hr. at 3100 F. In a number of tests for short-time applications in extremely high temperature flames, molybdenum so protected has given outstanding performance.

Examples of coatings of potential interest are silicon or silicon carbide on graphite for oxidation-resistance, boron carbide on graphite and other ceramic materials for wear-resistance and refractory metals, such as tungsten and tantalum on other metals for heat- and erosion-resistance under nonoxidizing conditions.

An outstanding advantage of the vapor-deposition process is that no heat treating is necessary to obtain a continuous coating.

To properly evaluate all types of ceramic materials, close cooperation between ceramists and gas turbine engineers is required. With this cooperation, gas turbines with higher operating temperatures, longer life, or both, and, perhaps, lower weight seem within the realm of not-too-distant possibilities.

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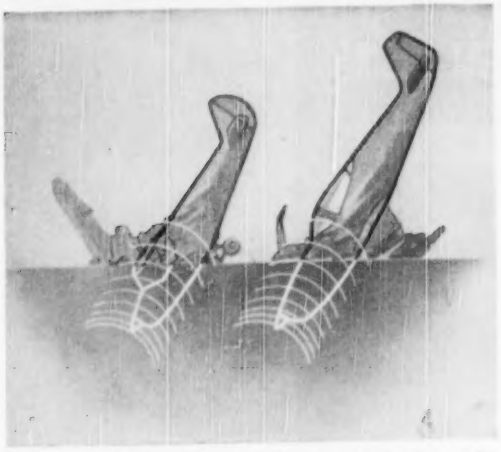
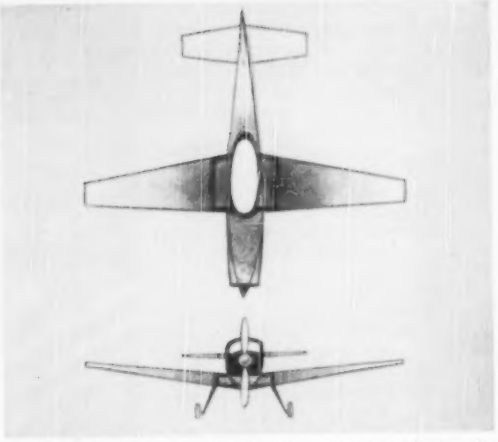
How Lightplanes Can Be Made Safer . . .



A Occupants' distance from nose of crashing plane may mean difference between life and death. Cockpit at right is intact.



B Cabin should be "citadel" of plane, with nose and wings designed to soak up force of crash, collapse away from the cabin.

Crash Safety *Can* Be Engineered

If today's lightplane incorporated all the safety features shown in the accompanying sketches, crash casualties would be drastically cut.

Released exclusively to AVIATION WEEK, these sketches illustrate many of the protective devices proposed by Cornell University's Crash Injury Research group—after eight years of thorough study of nearly 1000 lightplane accidents.

▶ **Body Rugged**—These safety features are based primarily on evidence that the human body, properly supported, can take crash impact forces better than any existing lightplane.

It already has been proven that persons, when supported, easily can withstand impact forces up to 35 Gs (AVIATION WEEK, Feb. 20). As for the human body's ability simply to survive crash forces, the indication is that this figure is near the bottom of the scale.

▶ **Make Plane Rugged**—But while a person harnessed in a seat can take it easily, a 35 G impact is more than conventional aircraft structures can withstand without destruction of the cockpit, so far as CIR can determine.

CIR believes private planes should have cockpit structures and body support provisions which can stand up to 25-35 G crashes at least as well as the persons in the plane. Give the occupants half a chance and "they'll walk away from most run-of-the-mill crashes." And more people will be interested in buying small planes.

Even if occupants are not properly supported and slam into cockpit structure in a crash, investigation points to the fact that chances of survival are raised considerably if there are fewer lethal objects, such as tubing, seat backs, instruments, etc., within range of the head.

Hugh De Haven, CIR director, stresses that injuries are "mechanical results" which largely can be controlled by aircraft design.

▶ **Lessening Danger**—Flight has brought with it the possibility of dangerous crash decelerations. But research now gives promise of taking a great deal of the sting out of accidents.

The course crash engineering is following logically leads to the day when occupants in private planes can expect to survive without dangerous injury when they crack-up at speeds up to 70-80 mph.—whether the plane hits vertically or at an angle, or smacks head-on into an obstacle. Even now, with virtually no crash protection, only about 10 percent of the persons annually involved in small plane accidents are fatally injured.

▶ **"Capsule" Safety**—It may not be too far in the future when occupants will be supported to exacting requirements in a structure which forms, in effect, a "protective capsule", carefully engineered not to collapse when the plane crashes into the ground up to a given speed.

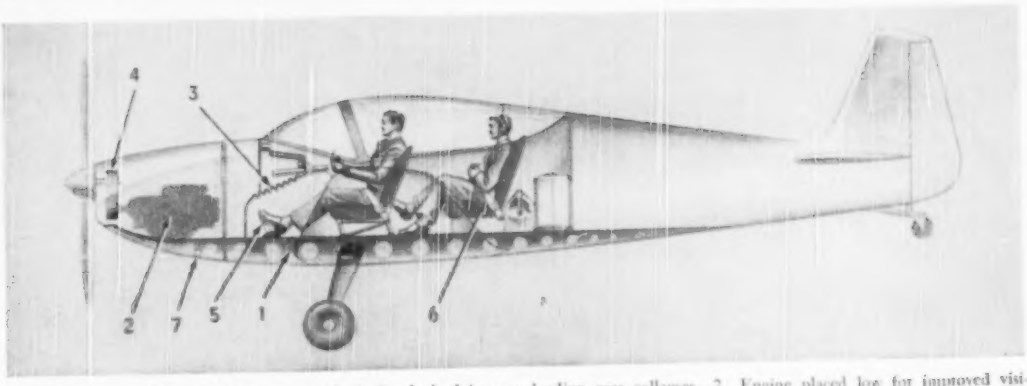
If the pilot, with this standard of protection built in his plane, is not exceeding this given "safe" flight speed in time of trouble, he can expect the structure around him to hold up, to stay in his seat, and to withstand the shock when the crash comes.

There now are planes in the design stage, providing protective features which, according to De Haven, "may assure pilots a greater degree of safety in the air than presently exists on the highways."

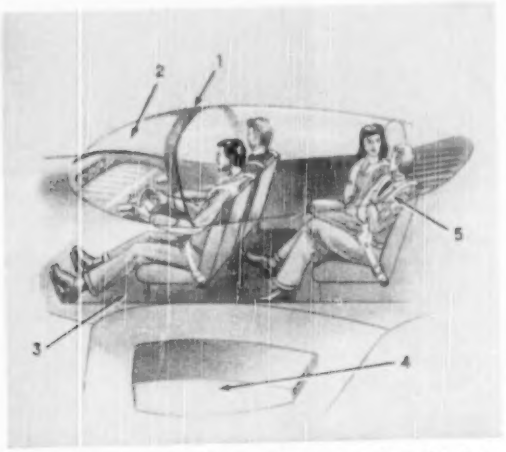
▶ **Proposals**—Keyed here to the accompanying illustrations are descriptions of major safety proposals made by CIR to increase crashworthiness and occupant survival in lightplane accidents:

A In plane, left, pilot sits close to nose with little crash-energy-absorbing structure and distance between him and engine. Arrangement is additionally dangerous by placement of gas tank between pilot and engine. Aside from fire hazard, pilot often is crushed when engine pushes gas tank and instrument panel into cockpit. Also, because of his forward position, he virtually "lands on his feet" in many crashes, with multiple injuries to lower extremeties.

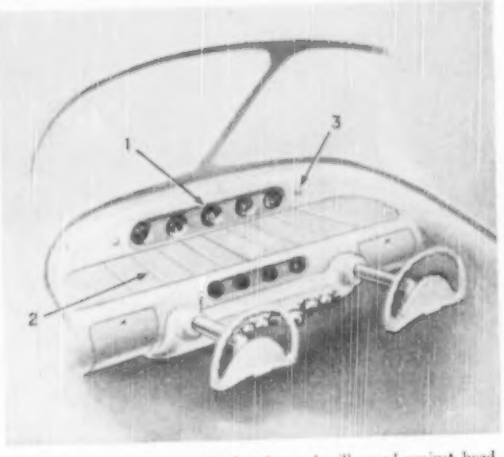
Plane, right, has structural arrangement now incorporated in several four-place craft. Pilot's seat is 7-10 ft. from nose, and tanks are placed in wing. By providing more structure between occupants and impact point, there is more opportunity for structural collapse and



C Safety features that can be incorporated: 1. Sturdy keel in case landing gear collapses. 2. Engine placed low for improved visibility. 3. Firewall backed by bulkhead. 4. Large propeller. 5. Strong rudder pedals. 6. Stronger safety belts. 7. Crash impact switch.



D All points in cabin and surrounding areas are designed to keep structure intact and protect occupants in a crash.



E Mounting instruments farther forward will guard against head injuries, cause of 75 percent of the fatalities.

greater absorption of crash energy ahead of cabin.

In line with this is CIR's finding that there should be "safer correlation between energy absorbing capacities of aircraft and minimum safe flights speeds." At present stage of aircraft engineering technique, "assured crash protection rapidly becomes impractical in small planes at speeds above 60 mph."

B Whether high-wing or low-wing configuration is used, cabin section should be strong point of the structure, and forward sections, wing panels and tail should be designed with decreasing structural strength away from cabin to give progressive collapse characteristics.

De Haven feels that if research were undertaken to analyze energy-absorbing properties of structures under kinetic loads, scientific data gathered in these experiments would allow major increases in crash protection with minimum weight penalties.

C Sturdy keel or skid (1) permits craft to slide instead of plowing into ground in low-angle accidents. In this type of crash, bottom edge of firewall in present aircraft often gouges into ground, causing extremely abrupt decelerations.

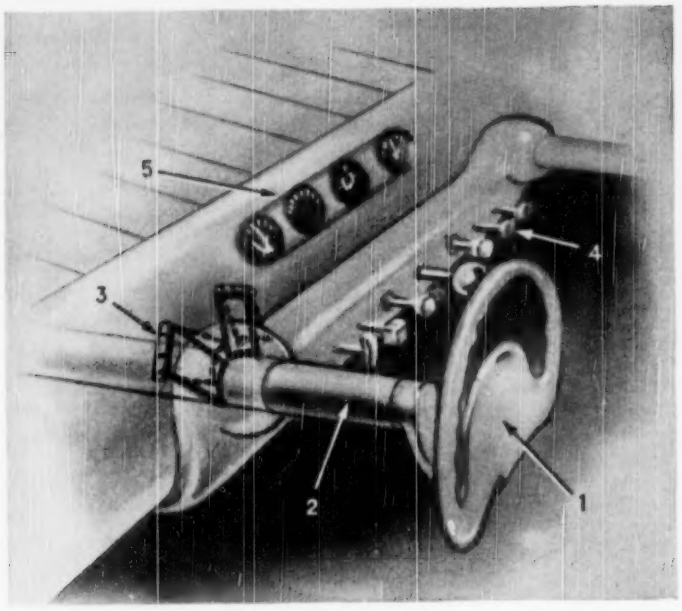
To prevent engine (2) from driving into cockpit, heavy firewall is backed by secondary, lightweight bulkhead (3). Air trapped between bulkheads provides "exceptional resistance to telescoping" of cockpit over engine section.

For greater forward visibility, even with pilot seated further aft, engine is lowered so that cowling can curve sharply downward from windshield, leaving only narrow cowling portion at center (indicated by shaded line). A larger propeller is suggested at a slightly higher position driven by gears or V belt drive (4), to cut noise levels.

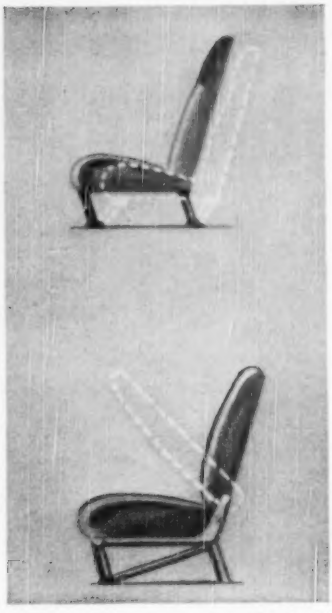
Rudder pedals (5) are designed to adequately support feet, while safety belts (6) have holding capacity of at least 25 G forward, 10 G upward, and 5 G to side. Belt loads should be carried to primary structure. If attached to seats, both structure and seat anchorage should be stressed to take equally heavy loads. An impact switch (7) cuts all circuits at battery when longitudinal deceleration is more than 6 G.

D Strong turnover structure is provided by T-shaped top brace (1). All bracing slopes away from passengers so there is less chance of direct head blows. Also, windshields and side windows (2) are designed to "pop out" instead of shatter if struck by occupants. Metal flooring or thin metal or fibre covering over plywood (3) lessens possibility that occupant's legs will be forced through cockpit bottom.

Fuel tanks are strong enough to withstand rupture in 20 G crash, are so



F Control wheel and control column can be designed to support body when it is thrown forward, instead of being a spear to impale body.



G Front seats, though adjustable, should be firmly fastened to floor.

placed as to make it difficult for them to be crushed or punctured in survivable accidents.

If wing tanks (4) are employed, De Haven suggests constructing them with slightly weaker outboard ends so that if they burst in a crash, "the gasoline normally will be sprayed away from engine, cabin and occupants," thus lessening the danger.

CIR is a strong advocate of shoulder harness (5), pointing out that if it were used faithfully "it would not be necessary to modify, rearrange, and redesign structures specifically to protect the head. However, no modern personal aircraft has shoulder harness as standard equipment and experience has shown that few pilots understand its value . . ." Hence, it is important to design cabin so as to minimize injuries resulting from headblows, which are sure to come in crash when occupants refuse to take advantage of shoulder harness.

E Considering that 75 percent of fatalities in survivable lightplane accidents are caused by head injuries, heavy flight instruments (1) are mounted well forward out of head range, but closer to pilot's line of vision. If he jackknifes over seat belt in crash, he hits "flight deck" (2), a soft metal shelf designed to absorb head impact. De Haven points out that, while skull fracture can occur if the head strikes an unyielding object at an impact velocity of 12 mph., injury may be avoided at 50-60 mph if the head hits a ductile object which can "give" approximately 5 or 6 in.

Still more protection is given by mounting instruments on separate panel secured to cockpit cowling by shear grommets (3) or inertia latches. In crash decelerations exceeding 6 G, instruments are thrown forward, out of range of pilot's head.

F Control wheel (1) distributes crash force over large area of chest and provides, as nearly as possible, protection equivalent to that given by shoulder harness. It is made of metal which will bend, rather than break, under heavy loads, and is attached to permit yielding, and adjustment to chest loads. Control column (2) is strong enough to resist buckling under heavy, forward and side loads and is equipped with inertia locks (3) which check rapid forward movement of column in decelerations of more than 6 G. Control knobs (4) are of soft material to prevent injury and each is shaped differently so that it may be identified by touch as well as by position. Small gages (5) also can be mounted to tear loose from panel.

G Front seats are adjustable, yet firmly anchored to prevent loosening under safety belt loads. They are capable of supporting 20 G compression loads without breaking. Where no shoulder harness is used, backrests on front seats are hinged to swing forward, out of head range of occupants in the rear seats.

H Even landing gears can be designed to absorb energy before force hits structure.

H Spring type landing gear is tapered to give increasing resistance when loaded vertically. In addition, it is attached to fuselage by friction joint for pivoting aft when loading would cause normal landing gear or structural attachments to fail. In low-angle crashes this arrangement would permit more crash energy to be absorbed since it permits a greater distance of deceleration and lower G-loads imposed on the aircraft proper.

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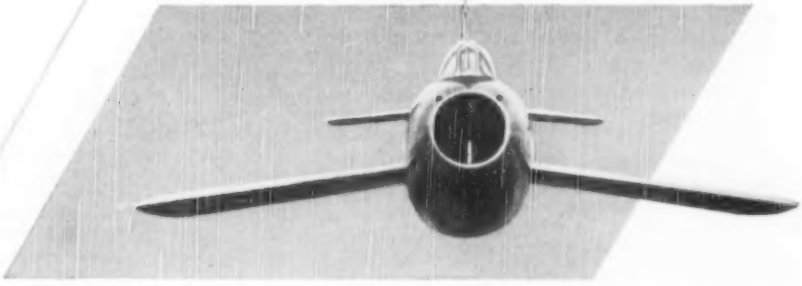

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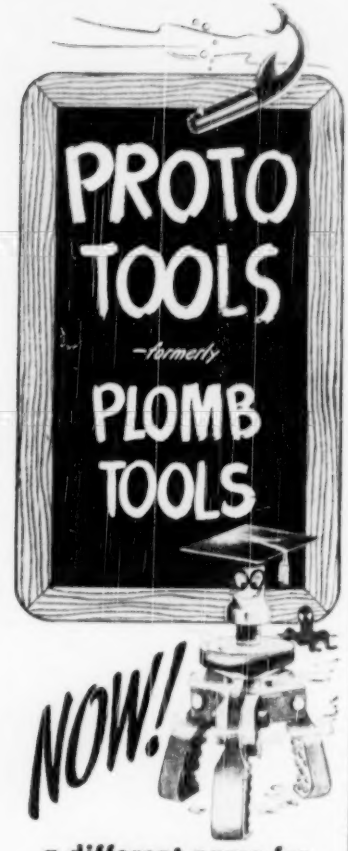

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Problems of Frequency Allocation

Repeated international conferences supposedly have settled question, but trail technical progress.

The radio frequency spectrum is already crowded. But frequencies in use are rivaled in number by those it is desired to use, and applications for new frequencies are made at a far greater rate than it is possible to process.

And in the midst of this fast-moving phase of avionics lies the slow-moving machinery of international conference, which, despite its genuine effectiveness in many phases of work, seems to drift behind the forefront of technical development.

► **Megacycles High**—Yet few activities have more far-reaching consequence in the economic and operational phases of avionics than those dealing with the international allocation of radio frequencies.

By the stroke of a pen, whole bands of frequencies can be made obsolete and entirely new band assignments made in some far-off city with its obviously vital effect on the daily operations of the huge avionic industry.

World War II avionic developments are chiefly responsible for the present chaos in frequency allocation. No international radio conference has ever seriously discussed the allocation of frequencies above 200 mc., yet several radars operating on 10,000mc. were widely used during World War II and experiments have been carried out using frequencies as high as one million megacycles. The radio frequency spectrum ends at about one billion megacycles, where the vibrations become infrared or heat waves.

It is already clear that exploration of the entire band of radio frequencies is nearing completion and yet international allocation effort has not yet produced agreement above a mere 200mc. But progress is being made, however slowly, and important machinery has been set up for future progress.

► **Beginnings**—But frequency allocation is no new problem. The first international conference dealing with the subject was the Berlin Radiotelegraph Conference of 1906. The worldwide importance of the decisions made at this conference was confirmed in April, 1912, when the U. S. Congress ratified the provisions of the conference and thus made the U. S. a part of international radio frequency allocation for the first time.

The United States played host to the world conference in Washington in 1927. But it was the International Telecommunication Convention in Madrid, held in 1932, that laid the framework for the present extremely detailed and widely-scoped nature of international frequency allocation. The General Radio Regulations developed by the Madrid convention was signed by the United States Dec. 9, 1932.

On Feb. 1, 1938, the International Radio Conference was convened in Cairo for the purpose of revising the Madrid convention. This Cairo Revision was signed by the United States and 69 other countries on April 8, 1938, and its provisions are still in force nearly 12 years later.

Thus, the "Cairo Revision, 1938, of the Madrid Convention, 1932" stands today as the official worldwide allocation of radio frequencies, as well as a wide variety of licensing, procedural and other provisions.

► **Postwar Meeting**—But the nations have not been idle since 1938 in the international frequency field. All work in this field was suspended, of course, during World War II, which is the chief reason for the long delay in revising the code.

The first postwar international meeting was the International Telecommunication Union Radio Conference of 1947, held in Atlantic City. This conference undertook to establish machinery through the use of which a complete revision of the International Frequency List would be obtained.

But of even greater importance was the decision to undertake this revision on the basis of engineering techniques and strict operational requirements, rather than the random "general agreement" method used previously.

► **Outgrowths**—Out of the Atlantic City meeting came three developments of primary importance to U. S. avionics.

First, the Provisional Frequency Board was established to continue full-time the frequency allocation work.

Secondly, the world was divided into three regions for the purpose of frequency allocation work in order to break down the job into regional activities. The United States (and all the Americas) falls under International Telecommunication Union Region Two.

Thirdly, the International Administrative Aeronautical Radio Conference was established as a separate activity concerned solely with aeronautical mobile radio frequency bands. It is the responsibility of the IAARC to transmit to the IFB any frequency assignment plan it might prepare for incorporation in the new International Frequency List.

► **Inter-American Activities**—At this point it is of interest to digress a moment into the conference activities of the inter-American countries, separate, as they are, from the international conferences.

The first inter-American radio conference was held in Mexico City in 1933, to explore the possibilities of inter-American agreement.

First administrative inter-American conference was held in Havana in 1937, and important decisions were made. This Havana conference drew up: (1) an Inter-American Radio Communications Convention, (2) an Inter-American Arrangement Concerning Radiocommunications, and (3) the North American Regional Broadcasting Agreement.

The Convention, which was ratified by the United States and the majority of the participating countries, generally covered organizational and general policy arrangements among the American republics and Canada for the handling of mutual radio communication problems.

The Radio Communications Arrangement was revised by the Second inter-American Radio Conference at Santiago in 1940, and, after appropriate approval, became an effective international agreement.

► **Rio Conference**—In 1945 inter-American countries gathered in conference at Rio de Janeiro for the purpose of revising the 1937 Convention of Havana and this was accomplished. The Radio Communications Arrangement of the Havana conference was not revised at Rio. At this time it was already planned to hold the World Telecommunication Conference in 1947 and the delegates at Rio agreed to withhold their negotiations until this conference in Atlantic City.

The Rio conference, however, prepared a Convention in much greater detail than available previously and, as proved later, set up a small-scale structure that served as an effective model for the huge Atlantic City conference two years later.

► **After Rio Meeting**—The Rio de Janeiro Convention, unfortunately, struck the type of snag that makes international agreement so frustratingly slow.

The Brazilian government was unable to send certified copies of the Rio Convention to participating countries

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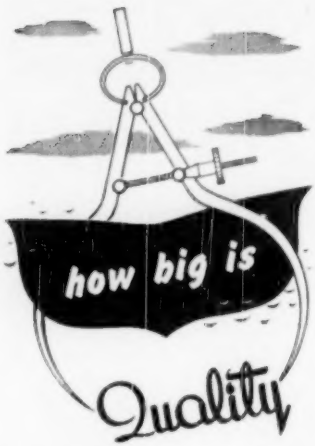

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until 1948 and there was not enough time for the required number of countries to obtain formal ratification by their legislatures prior to the Atlantic City conference.

Since the latter completely overhauled the structure of the International Telecommunication Union, there was no further reason for ratification of the Rio Convention and it has simply gone by default.

It had been agreed at the Rio Conference that the next radio conference of the American Region would be held at Bogota. When the Columbian government advised that it would be unable to act as host for the conference, the Administrative Council of the ITU passed a resolution to the effect that the American countries at the High Frequency Broadcasting Conference at Mexico City should assemble to decide the date and place for the next purely regional conference for the Western Hemisphere.

There being no indication that any other country was willing to issue invitations for the conference, the United States finally offered to serve as host and issued invitations for the interested countries to assemble in Washington.

▶ **Geneva Session**—Meanwhile, implementing the Atlantic City decision to create an International Administrative Aeronautical Radio Conference, the first session of the IAARC convened at Geneva on May 15, 1948.

This Conference worked for five months and agreed on an interlocking world plan for the assignment of frequencies for major world air routes as well as several detailed plans for such frequencies for regional use which were not acceptable to all participating countries.

The first session of the Conference recessed in October, 1948, with a resolution providing that the Second Session would meet in Geneva in August, 1949, and further providing that regional conferences should be held in the interim period to determine specific regional frequency requirements for the aeronautical mobile service and to draw up a plan for Region Two which would be submitted for consideration to the Second Session of the IAARC.

The adjournment resolution also requested the International Civil Aviation Organization to undertake certain studies and to submit a draft plan to the Second Session. The countries of Region Two agreed as to the desirability of the ITU and ICAO collaborating on a plan for the Western Hemisphere. It was further agreed that this plan should be completed by June 30, 1949 to permit its study prior to convening of the IAARC Second Session in Geneva in August, 1949.

▶ **Washington Meeting Makeup**—It is against this broad background that the radio communication conference held in Washington from March 15 to July 9, 1949, is placed in perspective.

This conference, for reasons of economy and convenience, was actually three conferences in one and most of the delegates served in their official capacity in all three phases of the activities. The Washington meeting was: (1) International Telecommunication Union Region Two Conference, carrying out the provisions for regional meetings of the ITU established at Atlantic City, (2) an International Administrative Aeronautical Conference Region Two meeting, to propose recommendations to the IAARC Second Session, and (3) the Fourth Inter-American Radio Conference, following up the Havana, 1937; Santiago, 1940; and Rio de Janeiro, 1945, conferences and as agreed at Mexico City.

Thus, at one and the same time, functions of the worldwide, inter-American and aviation phases of the overall frequency allocation problem were carried out.

▶ **Conference Successful**—The Washington conference was wholly successfully within the framework of such conferences, that is, various procedures and machineries were established through the use of which the detailed problem of revising the International Frequency List would be expedited.

The Aeronautical Radio Committee of the Washington conference was unusually successful in carrying out its obligations. The Committee managed to complete its final report for the IAARC Second Session on May 31, and was forwarded to the Secretary General of the ITU in time to meet the June 30 deadline.

The Aeronautical Radio Committee covered the specific problems of the allotment of exclusive high frequencies for aeronautical mobile communication in Region Two. In view of the paramount importance of this activity and the need to coordinate action by the ITU and ICAO, the Committee authorized the ICAO representative to submit proposals in ICAO's name and to participate fully with the Committee in formulating decisions.

The Committee adopted the ICAO procedure of handling conference subjects by working groups or "teams", which were disbanded when their work was completed. This system proved highly effective and all major problems received solutions acceptable to the interested governments and operating agencies.

In view of the fact that Region Two representatives at Geneva, in 1948, had not found it possible to reach full agreement on a regional plan, the unanimous

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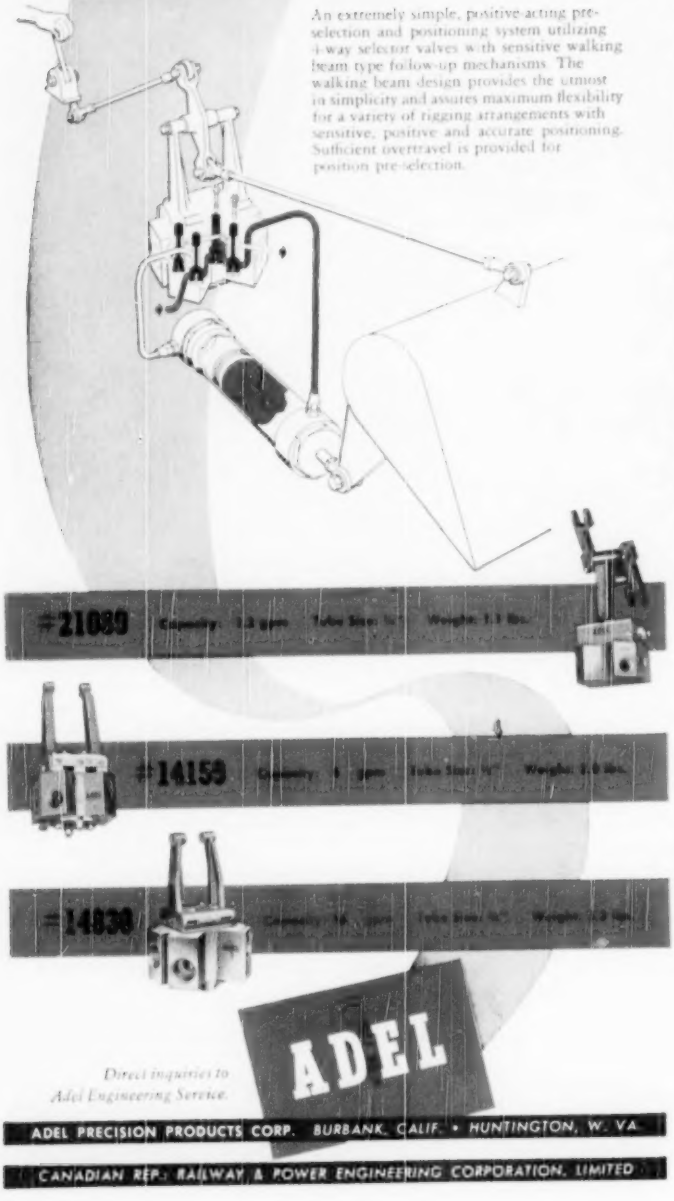

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adoption of the Region Two plan at Washington was a major accomplishment.

► **Conditions**—Because of its regional nature, none of the final documents of the Washington Conference require Senate ratification for action. The "Inter-American Radio Agreement, Washington, 1949," which replaces the Santiago Agreement, will require the approval of the President to become another in a series of Executive Agreements. It will come into force on April 1, 1950, if five nations have in that time accepted it and will be binding only on those nations that accept it.

The "Region Two Recommendations and Resolutions" will be submitted to the Provisional Frequency Board, where it will be subject to consideration and revision, after which it will be submitted to an Extraordinary Administrative Conference. The "Report to the International Administrative Aeronautical Radio Conference Second Session," after action at that session, will be incorporated into the worldwide plan for the allotment of exclusive high frequencies allocated to the aeronautical mobile service as finally developed by the Provisional Frequency Board.

► **Future**—The next step in this necessarily laborious process will be U. S. participation in the Extraordinary Administrative Conference, to be held Sept. 1, 1950, at a place not yet named, and the next worldwide conference in Buenos Aires in 1952. The inter-American phase of the problem next will be considered at Montevideo also in 1952.

In the interim the U. S. Government states firmly that it will continue active participation to the fullest extent in all conferences of the ITU and its several branches, particularly the IAARC meetings.

In such a manner does the complex machinery of international agreement work. Only the broad phases of the problem of frequency allocation have been outlined.

But the magnitude of the problem is seen in the fact that for every band of frequencies there are hundreds of applicants, each with their particular insistances and vast supporting data.

To make matters worse, a certain degree of secrecy is maintained by many of the delegates (including those of the U. S.) to avoid "showing their hand" in the matter of what frequency bands they will ask for themselves and support among their constituents.

It is against this background that the monumental problem of international avionic frequency allocation is judged. And from that background it is apparent that remarkably rapid progress is being made, even though such progress seems agonizingly slow to technicians in the field.

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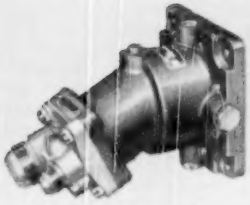

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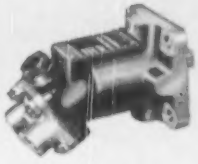

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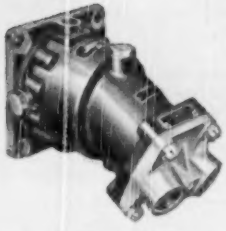

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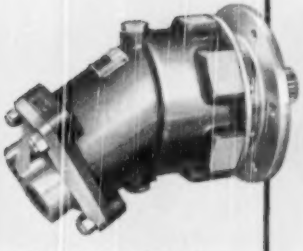

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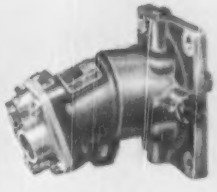

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Case History of Subcontracting

GE's Lockland operation has saved $35 million in equipment and gets high volume with few workers.

In February, 1949, the first jet aircraft engine produced at General Electric's Lockland, Ohio, plant was turned over to the Air Force. It was two months ahead of schedule.

Production of this engine showed that the idea of extensive subcontracting, utilizing skilled vendors to manufacture all parts and make subassemblies, and then feeding them to a central plant for assembly and test of the finished product, not only had been translated into reality, but worked very well. This method has been successfully utilized by consumer goods makers, and was also the basis for the aircraft "complexes" set up by the Nazis during World War II.

Now, after the first year of Lockland's operation, an Air Force representative estimates that this system, tagged "the Lockland philosophy," has saved about $35 million in plant equipment and tooling. The idea goes back to a report by the President's Air Policy Commission. Discussing industrial mobilization planning in peacetime, this report said: "Subcontract arrangements should be worked out in advance outside the aircraft industry. . . . The peacetime integration of such companies within the air industrial mobilization plan should expedite any expansion greatly."

▶ **Production Setup**—Lockland works it out this way: More than 220 suppliers and subcontractors contribute 15 major subassemblies and approximately 1000 smaller subassemblies and components for the J-47 axial-flow turbojet. The Lockland plant assembles and tests the finished product.

General Electric says this concept of peacetime operation has proven itself by its production record. Statistics are withheld because of Air Force security requirements, but GE states that "production to contract requirements has been delivered by a work force of 986 people operating on three shifts at Lockland."

Production facilities are located in a section of the huge plant where Wright Aeronautical built engines during World War II. Floor space totals 5,600,000 sq. ft.

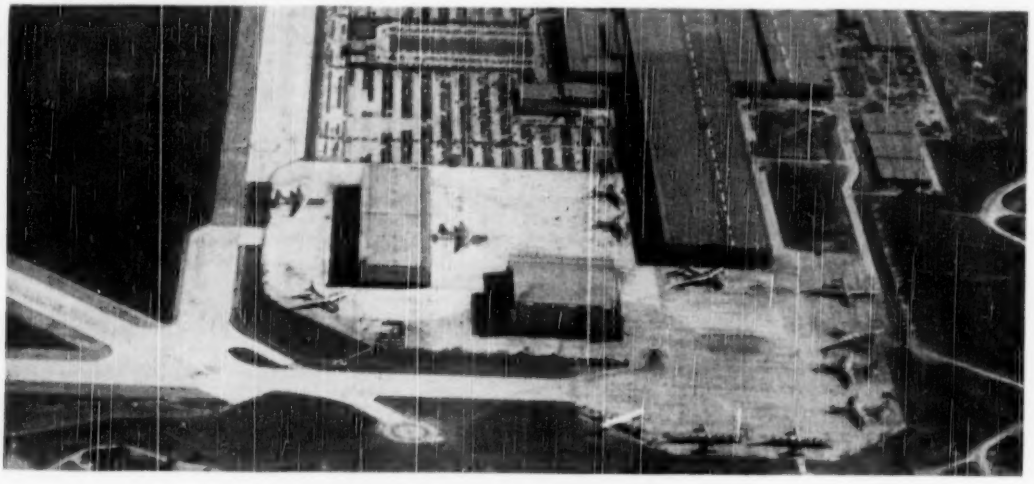
The factory, with the exception of three foundries, was acquired by the Electric Auto-Lite Co. from the War Assets Administration in 1948. By agreement, part of the plant, was to be made available for a government contractor upon request. So, when the Industrial Planning division of Air Materiel Command began placing new emphasis on the importance of subcontracting, space was made available at Lockland for jet engine production. GE occupies about 700,000 sq. ft.

▶ **New Problems Faced**—The Lockland plan raised new problems for engineers and planners. There was the matter of removing highly accurate machined parts—often extremely valuable—from the sealed containers in which subcontractors ship them. Special fixtures were designed to get the parts out of the containers and onto production type conveyances. Speed, caution, safety and convenience had to be considered.

Returnable shipping containers have been found useful. And handling costs and packing time were materially reduced by use of box stitchers and a large paper cutter for speeding up quantity wrapping.

▶ **Choosing Vendors**—In determining which companies would share in the engine building program, four factors were considered: Facilities required to do the job, facilities available in the subcontractors plant, subcontractor's previous experience and performance record on similar parts, subcontractor's quote price.

At least two and preferably three sources of supply were established for



CONVAIR'S B-36 BOMBER NEST

New striking aerial view of Consolidated Vultee Aircraft's Ft. Worth plant, home of the intercontinental B-36 bomber shows 12 of the long-range planes. Three appear returning from flight test, while the other 9 apparently are just off the big assembly line. Runways at left are part of Carswell AFB, headquarters of 7th Bomb Wing of the Eighth Air Force which operates the six-engine pushers, still believed to be the largest combat plane type in the world. XC-99 is parked on apron, lower left.

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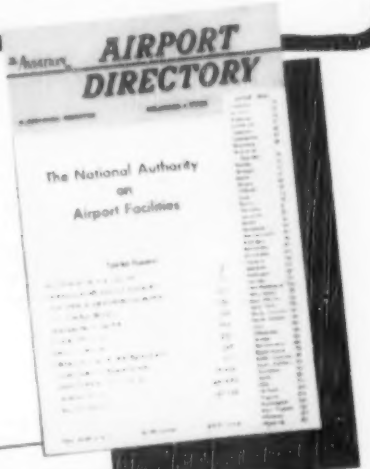

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each item. Order placement was made on the basis of competitive bids. Subcontractors were required to state their willingness to participate for the duration of the program and to remain competitive.

In the first six months of 1949, GE subcontracted more than $38 million in orders to some 1500 companies.

► **Reports to Vendors**—Constant studies are made to improve design and production, and to reduce the amount of strategic materials used in each unit. A subcontracting section maintains a card index on each component part used in the engine. A scheduling section screens any design changes. Then revised instructions are issued to subcontractors.

Vendors receive weekly progress reports with definite instructions to speed up or slow down production in order to maintain the flow of parts at the scheduled rate.

Each engine undergoes a test run, then is disassembled and inspected for worn parts and returned for a final run. Careful coordination of output carries through the testing phase, so testing will not clog the production line.

One major benefit of the Lockland operation is readily apparent. GE facilities at Lynn, Mass., also turn out the J-47, but Lynn is also the site of design and development activities. In event of a national emergency, the heavy demand on the Lynn operation would prohibit much increase in actual production there.

But, following "the Lockland philosophy," subcontractors can expand and a substantial increase in capacity can be attained when necessary.

PRODUCTION BRIEFING

► **Convair** employment will be increased 10% to 18,000 at the Forth Worth division, and will remain near the current 6300 figure at the San Diego plant during 1950, company officials announce. Activity in San Diego will be centered around an order for 48 T-29 navigation trainers, B-36 components, two XP5Y-1 flying boats, completion of Convair-Liners, and guided missiles. President Lamotte T. Cohu said Convair expects to deliver five or six transports to Brazilian lines if money exchange problems can be solved. He believes there is a market in Brazil for 15 or 20 additional Convair-Liners when financing can be arranged.

► **Prewitt Aircraft Co.** has opened a new plant at Clifton Heights, Pa., to produce bonded steel rotor blades for helicopters. The firm holds several government orders for these blades.

► **Aeroprojects, Inc.**, West Chester, Pa., is currently engaged in research on application of ultrasonics in improvement of aircraft materials and components and systems. Several new types of mechanical ultrasonic generators are also being developed.

► **TEMCO**, Dallas, Tex., has received a $285,000 contract from USAF to design, engineer, construct and install an integral blower system for ground heating in ten Northrop YC-125B's slated for arctic rescue missions. First craft is slated to be delivered to the company in April for installation, with remainder arriving at one-month intervals.

► **Minneapolis-Honeywell Regulator Co.** has moved St. Louis branch and Brown Instruments division into new office quarters at 4354 Olive St., St. Louis.

► **Rhodes Lewis Co.**, designers and makers of aircraft and ordnance equipment, have moved from 4008 W. Jefferson Blvd., Los Angeles, to a new plant double the size of former quarters. New location is 3652 Easthan Drive, Culver City, Calif.

Latest USAF Bid Awards

Air Material Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention MCPPSX72.

ABSTRACTS

For spray booths (50-566):
Devilbiss Company, Toledo, on a bid of $101,178.45.

For aircraft starters (50-577):
Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, on a bid of $283,838.20.

For indicators (50-666):
Lewis Engineering Co., Naugatuck, Conn., on a bid of $3423.20.

For crystal units (50-529):
Midland Mfg. Co., Inc., Kansas City, Mo., on a bid of $19,195.68.

For 5016 each conduit and ring assemblies (50-590):
Frank & Warren, Brooklyn, on a bid of $3803.15.

For 4 stand assemblies (50-714):
Laird Engineering Co., Charleston, W. Va., on a bid of $2792.

For 3074 gasoline cans (50-718):
Companies sharing: Protectoseal Co., Chicago, on a bid of $7700.32, and Eagle Manufacturing Co., Wellsburg, W. Va., on a bid of $691.80.

For 5850 sealed unit lamps (50-731):
Electric Auto-Lite Co., Toledo, on a bid of $2828.79.

For 4800 spare parts for F-1, F-1A, F-2 and F-2A (50-750):
General Electric Supply Corp., Dayton, on a bid of $20,869.46.

For 2500 hose assemblies (50-710):
United States Rubber Co., New York, on a bid of $42,200.

For 8 band saws (50-482):
Companies sharing: Buice-Crane Co., Toledo, on a bid of $2582.20, and C. H. Geisser Machinery Co., Dayton, on a bid of $2823.29.

For 600 electric connectors (50-704):
Adams Manufacturing & Engineering Co., Huntington Park, Calif., on a bid of $3900.

For 60,000 sq. ft. rubber matting (50-574):
Companies sharing: B. F. Goodrich Co., Akron, on a bid of $7967, and Acadia Syn. Products div., Western Felt Works, Chicago, on a bid of $18,758.50.

For B. F. cable insulation tester (50-697):
Industrial Instruments, Inc., Jersey City, on a bid of $8215.

For radar receiver, tuning unit (50-295):
Specialty Assembling & Packing Co., Inc., Brooklyn, on a bid of $316,884.20.

For trainer assembly (50-319):
Companies sharing: Design Fabricators, Inc., Dayton, on a bid of $1886.25; Management & Research, Inc., Primos, Pa., on a bid of $7600; Ideal Laboratory Tool & Supply Co., Cheyenne, Wyo., on a bid of $10,-756; G. Felsenthal & Sons, Inc., Chicago, on a bid of $327, and American Automatic Typewriter Co., Chicago, on a bid of $2500.

For infra-red oven (50-560):
Acme Infra Red Co., Detroit, on a bid of $6720.

For 4 stand assemblies (50-620):
Merriam Instrument Co., Cleveland, on a bid of $4310.

For gas breathing oxygen (50-649):
Trinity Oxygen Co., Fort Worth, on a bid of $8564.33.

For test stands (50-655):
United Mfg. Co., United Advertising Corp., New Haven, on a bid of $22,035.

For 2,740,000 feet tow target cables (50-656):
Hackensack Cable Corp., Hackensack, on a bid of $112,340.

For stand assembly, tester assembly (50-658):
Companies sharing: Greer Hydraulics, Inc., Brooklyn, on a bid of $3990, and AC Spark Plug div., General Motors Corp., Flint, on a bid of $355.

For repair cork insulation in Bldg. 25A (50-148):
Mundet Cork Corp., Cincinnati, on a bid of $13,888.

For 7 milling machines (50-526):
Companies sharing: N. Bansohoff, Inc., Cincinnati, on a bid of $4075, and E. A. Kinsey Co., Cincinnati, on a bid of $19,546.

For 1735 control stick switches (50-544):
Specialty Assembling & Packing Co., Inc., Brooklyn, on a bid of $16,656.

For 11,000 ball bearings (50-636):
McGill Mfg. Co., Inc., Valparaiso, Ind., on a bid of $15,290.

For 16,000 feet aircraft hose (50-690):
Aeroquip Corp., Jackson, Mich., on a bid of $7500.

For cameras (50-94):
Companies sharing: Graflex, Inc., Rochester, on a bid of $17,917.20; Williams, Brown & Earle, Inc., Philadelphia, on a bid of $6194; Morse Instrument Co., Hudson, O., on a bid of $14,988.60; Houston Corporation, West Los Angeles, on a bid of $26,787.50; Penn Optical & Instrument Co., Pasadena, on a bid of $11,920, and Pako Corp., Minneapolis, on a bid of $4710.45.

For 100,000 pounds gas expelled dry powder (50-542):
Phipps Products Corp., Boston, on a bid of $8500.

For cloth (50-518):
Companies sharing: Johns-Manville Sales Corp., Cleveland, on a bid of $2277, and Carborundum Co., Niagara Falls, on a bid of $64,615.22.

For signal generators (50-523):
Cole Instrument Co., Los Angeles, on a bid of $130,575.

For 3100 lamp assemblies (50-632):
Companies sharing: Graybar Electric Co., Inc., Dayton, on a bid of $17,950, and General Lamps Mfg. Corp., Elwood, Ind., on a bid of $1428.

For 2400 cords (50-635):
Companies sharing: Kas-Kel Electric Co., Inc., New York, on a bid of $2620.95, and General Electric Supply Corp., on a bid of $2802.85.

For transmitters (50-665):
Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, on a bid of $106,711.22.

For 300 plugs (50-679):
Connecticut Telephone & Electric div., Great American Industries, Inc., Meriden, Conn., on a bid of $2482.

For 386 bimetal thermometers (50-686):
Rochester Mfg. Co., Inc., Rochester, on a bid of $2614.57.

For 1144 gasoline cans and tanks (50-717):
Protectoseal Co., Chicago, on a bid of $12,132.94.

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Engine Instruments
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Pilots today are demanding an independent standby power package to insure operation of their electric flight instrument group. For they know that even the finest instruments money can buy, are reduced to dangerous liabilities when faulty power renders them useless or causes them to give incorrect indications. Eclipse-Pioneer's answer is a two-component package consisting of a lightweight ENGINE DRIVEN ALTERNATOR, and a small, panel-mounted POWER FAILURE INDICATOR. Normally, the small black face of the indicator is inconspicuous in its mounting near the gyro horizon, but if conventional power becomes faulty, a fluorescent disk instantly appears – giving the pilot approximately four minutes to switch to standby power before the gyros will precess. Two alternators are available for this system; one for electric gyro flight instruments only and the other for an electric compass as well as the flight instruments. Either one is conveniently installed on the engine vacuum pump drive pad. Here is instrument insurance that pays its own premiums – another example of the thinking that has made Eclipse-Pioneer the leader in its field.

ECLIPSE-PIONEER DIVISION OF

TETERBORO, NEW JERSEY

Bendix

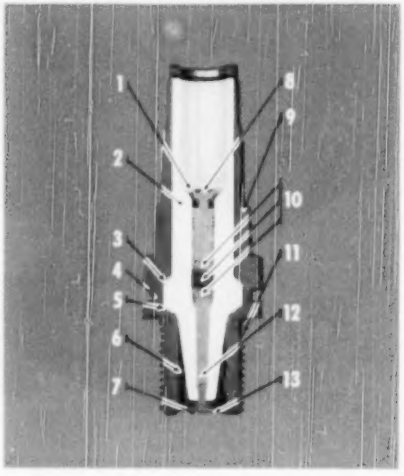
AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

STANDS OUT

BECAUSE IT

STANDS UP!



1 Core contact cap

2 One-piece insulator:
1. Patented Coralox. 2. No flashover downward from contact cap. 3. Eliminates dirt trap between core insulator and shielding barrel insulator. 4. Facilitates cleaning terminal well. 5. Mechanically rugged.

3 Nickel gasket

4 Heat-sealed, leakproof assembly

5 Nickel gasket

6 Ample clearance for abrasive blast cleaning

7 Platinum center electrode tip .060" dia.

8 Steel core pin

9 Brazed one-piece construction with zinc-plated finish

10 Gastight Hermetic seal
Copper-glass conducting seal. Glass-graphite resistor seal, halving electrode wear. Copper-glass conducting seal.

11 18 MM threads, precision-rolled to mirror finish

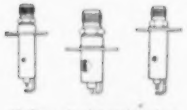
12 Silver, centrifugally cast to insure good heat conducting contact with insulator

13 One of two large .040" square platinum ground electrodes

The AC-181 Aircraft Spark Plug is amazingly trouble-free—astonishingly long-lived. After a continuous world flight of 23,452 miles in the B-50, "Lucky Lady II" the AC-181's were in excellent condition, despite their 94-hour beating in the stratosphere.

The AC-181 stands out because it stands up. It resists lead fouling better — requires fewer off-schedule changes—keeps on firing longer than any other plug we know of. Two outstanding reasons are the gap-retaining platinum electrodes and the patented *CORALOX* one-piece Insulator.

No other aircraft plug can offer you the same combination of extra-quality features. Approved by Pratt and Whitney and CAA for five P&W engines. Look at the sectional drawing and you'll see why.



AC Plugs for jet engines have also participated in the establishment of many speed records.

AC AIRCRAFT SPARK PLUGS

OTHER AC AIRCRAFT PRODUCTS

AC makes many aircraft products, all to AC's highest quality standards:

TACHOMETERS • TEMPERATURE GAUGES • AMMETERS • PRESSURE SWITCHES • FUEL GAUGES • OIL GAUGES • FLEXIBLE CABLE • FUEL PUMPS

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION • FLINT 2, MICHIGAN

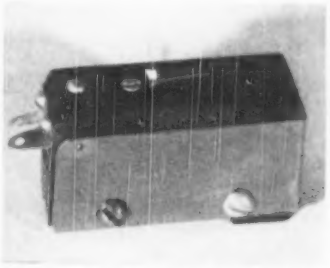
NEW AVIATION PRODUCTS

New Idea for Circuit Breakers

3-oz., 50-cent attachment for aircraft control switch claimed to offer same protection as larger devices.

Recent development of a small, lightweight circuit breaker attachment, designed to be adaptable to any aircraft control switch, may offer more complete protection to aircraft electrical systems at lower cost and less weight than is now possible.

Called the Safety Adapter, the unit is made to replace scores of heavy, expensive circuit breakers now found on control panels of large airplanes. The new device, said to be particularly suited for use with Micro Switches and operable over a wide temperature range, was developed by David M. Dutko, New York consulting engineer. Dutko says device has been sent to Wright Field for evaluation. He has set up a company—Safety Devices Mfg. Co., 570 Seventh Ave., New York, N. Y.—to manufacture the units.



MICRO SWITCH is also circuit breaker when adapter (dark area on top) is used.

▶**Low Weight and Cost**—The new adapter is a tiny thermal circuit breaker, incorporating a bimetallic element, which adds 3 oz. and a cost of 50 cents to each switch to which it is attached. In effect, it provides the switch with a fuse of its own. Present arrangement is to use many large circuit breakers, each protecting a series of switches—with the chance that a number of units may go out of operation because of an overload on a single circuit.

According to Dutko, the weight, size and price of a Micro Switch-Safety Adapter combination are far below those of circuit breakers now used to protect a series of switches, and are considerably less than those of unit-operating circuit breakers formerly used in military planes.

The space and weight penalty involved in use of large circuit breakers as both protective and control switches in individual circuits caused the Air Force to use fewer but larger such units. But this compromise still left up to 100 circuit breakers each weighing 3 to 8 lb.—on the control panel of a large bomber.

▶**One to a Switch**—Dutko proposes that one of his 50-cent adapters be attached to each operating switch in lieu of the row of heavy series-protecting circuit breakers. With this arrangement, an overload would throw only the switch of the circuit involved.

Now operation of the plane is hampered and may be endangered when a series of electrical units becomes inoperative because the circuit breaker protecting them is tripped by an overload in a single circuit.

Dutko says the weight of his unit remains at 3 oz. regardless of amperage. If fuses are used with the adapters as extra protection, he suggests the thermal type.

▶**Another Use**—An additional advantage Dutko cites is that his device can be used internally as an automatic reset "fuse" to close the circuit after a cooling-off period, and will tolerate reasonable overloads.

He claims the automatic reset feature can be built into control switches so that the toggle will return to the "on" position after the circuit has had time to cool off from an overload.

Dielectric Compound

Silicone dielectric compound, 81083, offered by **General Electric Co.**, Pittsfield, Mass., is smooth, homogeneous mixture designed to provide chemically stable, waterproof, dielectric sealing compound for aircraft ignition systems and electronic equipment.

Stated to remain substantially unchanged by temperatures from —70 to 450 F., compound will wet and adhere to both metallic and non-metallic surfaces. It is non-corrosive and relatively inert chemically.

In appearance and consistency, product resembles medium heavy translucent grease. As a dielectric it prevents arcing from moisture condensation on spark-plugs and coils.

Storage Protection

For speedy, low-cost packaging of materials, Westcoat-Clear No. 202 protective coating compound, offered by **Western Coating Co.**, 85 W. Union St., Pasadena 1, Calif., can be stripped off parts, after they are removed from storage, and remelted for further use.

Material is cellulose acetate butyrate compound, approved for aeronautical use and conforming to government Specifications JAN-C-149 and AN-C-117b.

It is not affected by salt water, gives watertight seal and is claimed to provide "absolute protection against rust, corrosion and abrasion."

In test, parts coated with product showed no evidence of rust after being subjected to 100 F., 100 percent humidity for 30 days. Coating is designed to withstand temperatures ranging from —45 to 160 F. It is nearly water-white and transparent. Numbers and writing on part can be read easily through coating.

Maker states packaging costs are reduced, since parts can be covered in single operation taking only few seconds.

Parts packaged in this manner are claimed to be suitable for inter-plant, domestic or overseas shipment. Product has 990-psi. tensile strength, 455 F. fire point, and can be reused as long as it has not been contaminated.

New Stainless Steel

Represented to be specially suitable for aircraft application, 17-7 PH stainless steel, developed by **Armco Steel Corp.**, Middletown, Ohio, has corrosion resistance comparable to 18-8, yet has mechanical properties equal to those exhibited by high carbon spring steel and music wire.

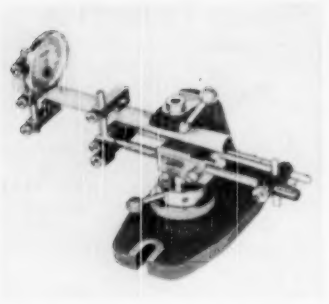
It is said to have good fabricating properties, excellent elastic properties, and can be hardened by low-temperature heat-treatment.

Material has yield strength in compression approximately equal to, and in some cases higher, than yield strength in tension.

The new steel is available in soft or hard temper sheet and strip, soft temper plate, and hard and extra hard temper wire.

Tensile strength of soft temper sheet as supplied is 115-145,000 psi.; after hardening it is 185-205,000 psi. Yield strength in tension is 35-45,000 psi. before hardening, 160-190,000 psi. after hardening. Yield in compression is 160-200,000 psi. after hardening.

Properties of hard temper sheet after hardening are 225,000-psi. tensile strength, 250,000-psi. yield strength in tension, and 235,000-psi. yield in compression.



For Accurate Drilling

Swiss-made universal drilling tool, "Reglus," distributed by **Cosa Corp.**, 624 Chrysler Bldg., New York 17, N. Y., simplifies exact drilling of round, flat, square or hexagonal parts with accuracy of .0003 in. With accessories, it drills holes at predetermined intervals, adjacent holes for making slots, holes at any radial angle, and holes in balls. Automatically centering, unit eliminates tracing-out and center-punching.

Besides its use as drilling tool, device can be used as angle comparator in two planes. It serves as depth gage and center distance comparator on round, square and hexagonal stock, and can be used as miniature jig borer.

Tool handles work pieces up to 1¼ in. dia. and accommodates series of cylindrical drill bushings having drill holes ranging up to ½ in. Accessories include V-mount for holding parts from ⅜ to ½ in. dia., cone mount for drilling balls up to 1¼ in. dia., and a modified mount for drilling flat and eccentric pieces.

Sensitive Relay

For protecting aircraft instruments and accessories from effects of underfrequency or over-frequency, **Varo Mfg. Co.**, Garland, Texas, offers line of 400c. frequency sensitive relays.

In under-frequency application, relay is designed to open 400c. supply circuit when frequency falls below predetermined safe point, insuring positive protection of equipment against excessive currents caused by lowering of impedance when frequency drops.

Design is such that failure of relay removes all loads. Also, inoperative relay can be manually by-passed for emergency operation.

With 5-amp., double-pole, double-throw contacts, hermetically sealed unit may be used with voltages ranging from 75-150. Operating current is derived from main power source. Relay can be furnished to open or close at frequencies from 350 to 1000 cps. with a differential of 2 to 40 cps. Weighing 1¾ lb., device has 4-in. diameter and height.

Sander and Grinder

For medium-duty sanding or light-duty cup wheel grinding, portable air-powered sander, made by **Buckeye Tools Corp.**, 21 W. Apple St., Dayton 1, Ohio, is said to offer considerable improvement over previous models.

According to maker, unit is 10 percent lighter than previous models of equal capacity, but has 25 percent more power. Available in five models, with speeds of 2400, 3600, 4500, 6000 and 7500 rpm., device is designed for use with 5- or 7-in. sanding pads. For cup wheel grinding, wheel sizes of 4, 5 or 6 in. are supplied.

Powerful V-Belt

To reduce number of belts required for a desired power transmission, "High Capacity" multiple V-belt, with 40 percent increase in hp. rating over comparable sizes, is announced by **B. F. Goodrich Co.**, Akron, Ohio. Belt also is particularly suitable in applications where dissipation of static has been found essential.

Maker states increase in capacity has been effected without stiffening belt construction or reducing safety factors inherent in standard types.

Dial Bore Gage

Quick and accurate determination of diameters of internal grooves for "O" rings, snap rings, and straight bores is claimed for a new dial bore gage, offered by **Rimat Machine Tool Co.**, 1117 Air Way, Glendale 1, Calif.

Indicator is readily located on the diameter of the cut to be measured and dial immediately gives desired dimension. Standard instruments measure diameters from ½ to 6 in. Two sets of instruments are offered by manufacturer: Series S, giving direct readings in thousandths over entire range of the instrument; and Series T, giving plus or minus indications in tens of thousands for any dimension to which the gage is set.

Standard tip sizes are ⅛ and ¼ in. o. d., although special tips are available for measuring snap ring grooves as small as .030 in. in width.

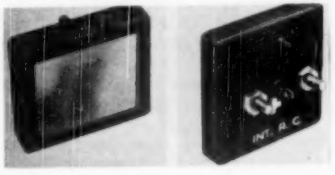


Photo-Cell Control

For varied industrial uses, including automatic control for lighting air fields, **International Rectifier Corp.**, 6809 So. Victoria Ave., Los Angeles 43, Calif., offers hermetically sealed selenium photoelectric cell. It has average current sensitivity of 600 microamperes at an illumination of 100 foot-candles, with a 100-ohm external circuit resistance. Unit is self-generating type and does not require external source of power. Electric current is generated when cell is exposed to light.

Unit measures 2 x 2 x ⅞ in. Active cell area of the control device is approximately 2.25 sq. in.

FINANCIAL

Airline Profits Up Market Prices

Continued dividend payments, plus debt retirement give investment and speculative value to securities.

The restoration of airline credit continues to show steady progress in the investment community.

New recovery price peaks for airline senior securities is the outward reflection of the industry's financial health.

Currently, the most dynamic action was American Airlines' retirement of $4,050,000 of its 3 percent debentures due June 1, 1966, in anticipation of sinking fund requirements. In this move, American has satisfied all sinking fund requirements on its original $40 million issue up to June 1, 1953.

▶ **Buys to Save**—The acquisition of these sinking fund bonds was accomplished quietly at a material discount, with the saving redounding to the benefit of the company. Current market quotations of around 95 gives these debentures an indicated yield of around 3.26 percent.

Originally marketed in June, 1946, by a syndicate headed by Kidder, Peabody & Co., at a price of 102 to the public, these debentures sold as low as 67 during early 1948. Current market prices compare favorably with better grade corporate credits.

▶ **Better Break at Capital**—A sensational turn of events appears to have accompanied Capital Airlines' successful recapitalization, completed last November. Formerly plagued by the straitjacket provisions of an original $10 million convertible debenture issue, the company recently was able to obtain desirable modifications.

The original issue, reduced to $7,385,000 by late last year, was offered for exchange into two separate new debenture series. The new Series A carries a fixed interest rate of 4 percent while the new Series B will pay 4 percent interest only if earned, but is convertible into common stock at the rate of 90 shares per $1000 principal amount of convertible debentures.

It is this conversion privilege which pushed the market price of the Series B debentures up to 106¾ a few weeks ago.

Probably this represented the first time during the postwar recovery that an airline senior security sold above par. The Series A, which now represents the senior debt of the company, recently sold at 85¾, indicating a current yield of around 4.7 percent. At recent prices, the new securities are equivalent to a price of better than 95 on the old debentures exchanged and which sold at around 70 less than five months ago.

▶ **Valuation Higher**—While having no public distribution, United Air Lines' 3½ percent debentures, originally issued in the amount of $12 million and placed with two insurance companies, have been accorded a higher market valuation as a result of the improved quotations for American's debentures. In the past, the National Association of Insurance Commissioners have valued the United debt at the same level publicly established by American.

Also due for valuation improvement, but not yet accomplished, are the $38 million of TWA debentures all held by the Equitable Life Assurance Society of the United States. As of Dec. 31, 1948, the regulatory agency directed the insurance company to carry these debentures at 50 cents on the dollar. It is difficult to see, in the light of the substantial improvement in TWA's finances and earnings, how this low valuation can again be imposed.

▶ **Preferred Moves Up**—Preferred shares of airlines have also improved in investment standing.

American Airlines preferred is obviously improved in position as a result of retirement of part of the company's debt. There are 400,000 shares of this senior equity outstanding. Sold to the public at around $100 per share in June, 1946, this issue declined to around 47 in the late 1948 tax trades, gradually recovering to a recent peak of 75¼.

Despite a period of financial stress, regularity of dividends, amounting to $3.50 per share annually, have been paid as due. At current market prices, the American preferred returns an income of about 4.6 percent.

The United Air Lines preferred has made an even more pronounced recovery marketwise. These shares, about 95,000 outstanding, were marketed through rights to common stockholders under a stand-by agreement with Harriman, Ripley & Co., in January, 1947, at an indicated price of around $105. As doubt began to appear as to United's credit standing, a steady deterioration in market prices developed with quotations of $57.50 late in 1948.

Here, too, as United earnings and finances improved and dividend payments were maintained, the market price of the company's preferred rose steadily to a recent level of around 86. At this price, the yield is around 5.2 percent on this stock paying dividends of $4.50 per share annually.

▶ **NWA on See-Saw**—Northwest Airlines issue of preference shares appears to be the most volatile among the senior equities in the industry. A total of 390,000 shares of 4.6 percent preference stock was marketed at $25 per share in April, 1947, by a group headed by Auchincloss, Parker and Redpath. Apprehension attended continued dividend payments on this issue almost at the outset, causing the shares to sink as low as $13.625 early last year.

Bolstered entirely by earnings developed by its international route and made possible by high mail payments, a substantial improvement in the company's credit was experienced during the year. This has been reflected in relatively higher market quotations for its senior equity. Further, it is believed that recent operation of sinking fund purchases of the preference shares may have caused this stock to sell at a new high recovery of 21¼. Current quotations are around 19, providing a yield of slightly better than 6 percent.

Northeast Airlines, Inc., a few years ago, issued about 80,000 shares of a cumulative convertible preferred stock of which around 77,000 shares are owned by the Atlas Corp. Since its issuance, however, no dividends have been paid on the Northeast preferred.

▶ **Conversion Attractive**—A latent attractiveness in all of the preferreds is the conversion feature. Interesting speculative appeal is attached to these senior equities in periods of rising markets because of the conversion privilege.

This conversion right is of great importance where earnings begin to accumulate rapidly and become available to the common stock in an increasing measure. Dividend income on the preferred shares being fixed at a stated amount, participation in a greater distribution of income that may be available by common share earnings is possible only through conversion of the senior equity into common stock.

Each share of American preferred is convertible into common at $21 per share of about 4.6 shares of common for each share of preferred. One share of United preferred has a call on four shares of its common. Each share of Northwest preference is convertible into one and one-half shares of common.

At present, common stock prices of the three major airlines involved are far below the levels necessary to accord their respective preferreds a premium because of the conversion privilege.

The course of airline debt and equities, marketwise, will continue to be determined by the earnings outlook of the separate carriers.—**Selig Altschul**

Oswald Ryan

David Behncke

When was safety first—in 1939 or 1949?

Is New Air Safety Board Needed?

Pilot union tells Congress it is. CAB says no. And each side offers figures to prove its own case.

By Charles Adams

A head-on clash between the Air Line Pilots Assn. and the Civil Aeronautics Board has developed in congressional hearings on the need for new air safety legislation.

With President David L. Behncke leading the attack, ALPA has mounted Capitol Hill with a set of statistics designed to show that air safety has suffered badly since it was placed in the care of a CAB bureau nearly ten years ago. The pilots' union wants Congress to re-create the independent Air Safety Board, which was set up under the Civil Aeronautics Act of 1938 but abolished in 1940 under a Presidential reorganization plan.

▶ **Progress Cited**—Showing an unusual willingness to enter the fight, CAB has presented its own figures to prove that airline safety has made remarkable progress since the independent Air Safety Board died in 1940. CAB Vice Chairman Oswald Ryan told a House Interstate and Foreign Commerce subcommittee that Behncke's statements and statistics were "inaccurate and misleading."

Behncke had told the subcommittee that CAB delays in promoting new safety regulations, such as requiring reversible-pitch propellers on all airline transports and making full-face oxygen masks available in the cockpit, had contributed to a number of accidents in recent years.

▶ **ALPA Walkout**—The ALPA-CAB feud on air safety procedures flared up last November during hearings on the crash of an Eastern Air Lines DC-4 and a P-38 fighter plane near Washington National Airport. Behncke withdrew his representatives from that hearing after CAB limited both the statements ALPA could place in the record and recommendations the union could make.

ALPA said this action, coupled with failure of hearing officers to call as witnesses any of the pilots' safety representatives who served on the investigating teams, reduced the pilots' presence at the hearing to a meaningless formality. CAB Member Harold A. Jones, senior officer at the hearing, intimated that ALPA was trying to use the session to plug for an independent air safety board.

Renewing his contention that CAB is "twiddling" with air safety, Behncke informed the House Commerce subcommittee that re-establishment of the independent air safety board, as recommended by the President's Air Policy Commission over two years ago, is "must" legislation. Behncke said that during the ASB's 22-month existence (from August, 1938, through June, 1940) the domestic air transport industry had the lowest number of fatalities in its history.

▶ **Longest Safe Span**—For the last 17 months of the ASB's tenure there were no fatal domestic airline accidents—the longest safe span on record. Behncke said that the mark of 3.2 fatalities for each million passengers carried during the ASB's existence has never been remotely approached.

At present, Behncke declared, CAB and CAA, as rule-maker and enforcer, judge the results of their own activities in air accident investigations. "But an independent board is based on the correct concept that the implementers and enforcers of the rules . . . could not be relied upon to investigate themselves in the event of accidents . . . and come forth with findings and recommendations that might reveal their own shortcomings, laxities and inactivity."

▶ **Bills Pending**—ALPA endorses legislation introduced by Rep. Robert Crosser (D., Ohio), chairman of the House Commerce Committee, and Sen. Pat McCarran (D., Nev.), which would:

• **Set up** an independent air safety board of five $12,000-a-year members with six-year terms to take over the activities of CAB's Safety Bureau. Two members of the new board would be pilots, one with at least 6000 hr. flying time in scheduled air transportation; another a licensed private pilot with at least 2000 hr. flying time. No officer or director of an airline could be appointed to the board.

• **Authorize** ASB to investigate air crashes and report, with recommendations, to CAB and CAA. Although it would lack enforcement powers, ASB would make annual reports to Congress.

▶ **ATA Opposition**—The Air Transport Assn. strongly opposes independent air safety board legislation. Some industry officials believe the transport pilot member of the board would almost certainly be a member of ALPA and would tend to vote against findings of "pilot error" in crashes. They see no reason why management membership on the board should be banned while pilot membership is required.

Further, it is feared that ASB might make scores of economically unfeasible safety recommendations to CAB. Thus CAB would be on the spot continually, while ASB would be in a comfortable "I told you so" position.

Another part of the ASB legislation, intended to protect witnesses, would bar the use of information gathered in accident investigations "in any action for damages, for a civil penalty or for suspension or revocation of a certificate." This provision is viewed with

suspicion in some quarters. Rep. Carl Hinshaw (R., Calif.) inquired whether this might not prevent effective suits for damages or license revocation action against drunken or reckless pilots.

▶**Ryan Replies**—Both Hinshaw and CAB Member Ryan called the House subcommittee's attention to the case of former American Airlines pilot Charles R. Sisto, who in October, 1947, engaged the gust lock mechanism of a DC-4, sending the craft into a 7500-ft. dive near El Paso, Tex. Ryan noted that ALPA defended Sisto and objected to introduction of any admissions of Sisto or any immediate testimony submitted by members of ALPA.

"In that case," Ryan declared, "we felt that the interests of public safety were such that ALPA should have been anxious to see that the pilot received proper punishment instead of defending him. We think there is an obligation on ALPA in such situations to see that all necessary facts come to light."

Ryan said he has no recollection of any specific accident investigation in which ALPA or anyone else charged that the mishap involved a preventable fault on the part of CAB. He warned that hastily adopted regulations may turn out to be a hazard.

▶**Safety in Reverse**—The CAB member cited the fatal United Air Lines DC-6 crash near Mt. Carmel, Pa., in June, 1948, when the crew apparently was incapacitated by a concentration of carbon dioxide gas which seeped into the cockpit after extinguishers were discharged in the forward cargo pit following a false fire alarm. Behncke said that had CAB required full-face oxygen masks in the cockpit, as recommended by ALPA, the crash might have been avoided.

But Ryan pointed out that the mishap actually stemmed from safety steps taken to prevent baggage compartment fires. Two safety devices suddenly became hazards—the smoke detector which was intended to warn of a fire, and the CO_2, which was intended to put it out. The smoke detector regulation has since been withdrawn.

▶**Reversible Props**—Turning to reverse-thrust props, CAB officials said they, too, may reduce, instead of promote, safety. CAB cited six instances in six months when props reversed (sometimes on landing approach) when they were not supposed to.

Behncke claimed that had reverse-thrust props been required on all transports, they might have prevented the United Air Lines accident at LaGuardia Field in May, 1947, when a DC-4 crashed off the end of a runway during takeoff. He said that had CAB adopted in June, 1947, an ALPA recommendation that reverse-thrust propellers be required on all airline transports, 13 subsequent accidents might have been prevented.

CAB replied that even with reverse-thrust props the UAL DC-4 could not have been stopped in time, and other accidents cited by ALPA would have occurred. Board officials pointed out that six of the 13 accidents listed involved DC-3s, for which reverse-thrust propellers are not available.

▶**Records Compared**—Ryan reported that passenger fatalities per 100 million passenger miles flown on scheduled domestic and international carriers declined from 5.2 in 1938, 2.3 in 1939 and 2.8 in 1940, to a record of 1.0 in 1949. He compared the 1,459,000,000 passenger miles flown, the three fatal accidents and the 12 passenger fatalities on the domestic airlines during the ASB's 22-month existence with the 6,187,000,000 domestic passenger miles flown without fatal accident or passenger fatality during the 11 months between Sept. 1, 1948, and July 31, 1949.

The CAB member also noted that U. S. international flag lines have, since April, 1948, flown more than 22 months without a passenger fatality.

Window Blow-out Brings New Tests

A manufacturer whose product offered promise of solving some pesky troubles of the airlines, last week had trouble of his own.

As one result, a few Lockheed Constellations were being operated with temporary minor changes in flight planning.

The product is Sierracin, a guaranteed non-crazing plastic for aircraft windows (AVIATION WEEK, Jan. 23). It was off to a fine start in replacing other plastic materials and glass in passenger windows of Constellations of several airlines. The trouble came when a Sierracin window of a PAA Connie blew out under pressure at 20,000 ft. and a sleeping stewardess was pulled halfway out.

▶**Results**—Sierracin windows immediately came under airline suspicion. PAA ordered the former windows, made of Plexiglas, restored. EAL took out three Sierracin windows under test, sent one to Sierra and is examining the others. TWA had only two Sierracin panels installed, and replaced these. PanAm, while the change-over was being made, was requiring that seat belts be fastened when Sierracin-equipped planes were pressurized. For about 12 hours, until it determined which planes had the Sierracin windows, TWA had a somewhat similar requirement.

PAA turned pieces of the shattered window over to Civil Aeronautics Board investigators for laboratory tests. Until completion of these tests, PAA is not drawing any conclusions on the future use of Sierracin.

▶**Conflict**—Window was mounted, as is

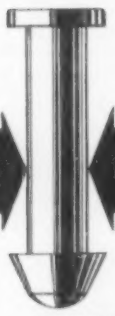
INTRODUCING TO design & stress ENGINEERS

the new hi-shears

HS-27 flush head

HS 28 flat head

+.000 -.0005



with the CLOSE TOLERANCE SHANK

The answer to design requirements where a close fit (either slide or interference) is needed in critical fitting attachments. HI-SHEAR close tolerance shank rivets are now available in two minimum hardness ranges, 125,000 psi tensile and the new 160,000 psi tensile.

The new hi-tensile HI-SHEAR rivet features 160,000-180,000 psi hardness, rebalanced proportions, a 24ST collar, tensile strength approximately equal to an AN bolt plus the proven advantages of HI-SHEARS, saving weight, time and space.

DASH NUMBER	DIAMETER
— 6	.1894
— 8	.2492
—10	.3117
—12	.3742
—14	.4367
—16	.4991
—18	.5616
—20	.6240

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THE hi-shear RIVET TOOL CO.
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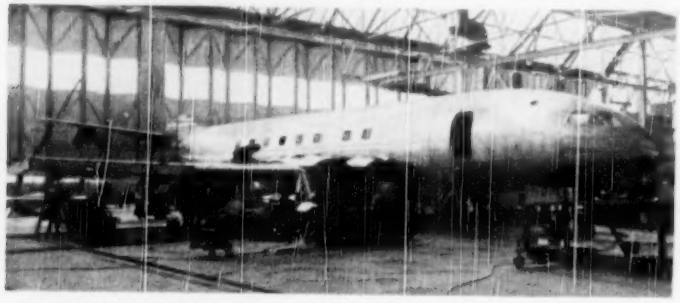
customary, inside an outer panel of Lucite, which served as a fairing. Milton R. Crossman, vice president of Sierra Products Co., maker of the material, says the outer panel was badly crazed and that the window was improperly mounted. A broken outer panel could have driven through the inner window.

Pan American investigators at Miami, where the plane landed, concluded that the installation was not at fault. According to Pan American, Gene Armstrong, Sierra representative at Miami, concurred in that view.

► **Outlook**—Sierracin window that broke was installed last November, and had a little more than 800-hr. use. Sierra gives a one-year unconditional guarantee on the panels. The PAA blow-out was the first difficulty experienced with a Sierracin window. But it is of serious concern to engineers. Here's why:

Other window coverings will craze or crack, so give notice of impending failure. The PAA panel failed without warning. If the PAA blow-out was due to an outright failure of Sierracin, and if the material will fail without warning, airline maintenance people see worry ahead.

But Sierra Products gives no indication of future sales difficulties. The company says that Lockheed (which has now re-opened its own investigation of Sierracin) has just placed a new $2500 order for the material. It has some new Boeing business. And it says that the PAA blow-out will give further support to its argument that outer windows of pressurized planes should also be made of Sierracin.



COMET PRODUCTION starts with 6000 workers on overtime and 16 planes on line.

Herlihy Sees Jet Dominance Near

The turbine engine within 10 years may completely replace the piston engine for all aircraft of over 1000 hp., in the opinion of J. A. Herlihy, United Air Lines' vice president-operations.

► **Liked Comet**—Returning to the United States after a 12,000-mi. trip inspecting foreign engine developments and airline operations in Canada, England and Europe, Herlihy said he was especially impressed by Great Britain's de Havilland Comet. He flew the 40-passenger, four-jet transport at 485 mph. at an altitude of 32,000 ft. as easily as any conventional plane and without any semblance of vibration."

Herlihy said that with planned improvements in cabin pressurization the Comet would operate even higher than 32,000 ft. when placed in commercial service. British Overseas Airlines Corp. and Canadian Pacific Air Lines have placed orders for the Comet, and Herlihy estimated these companies will have them in regular scheduled operation within 18-24 months.

The UAL executive placed the Comet ahead of any other turbine engine development he saw on his trip. The turboprop power plant, he declared, has interesting features for commercial used in the immediate future, but the ideal is the straight jet, which is further away."

► **U.S. Lags**—Herlihy said that everything in the way of new development abroad was devoted to the turbine power plant. "Government-financed turbine prototype development programs have permitted the British and Canadians to steal a march on the U.S. in this important field, but an American turbine development program started now would quickly bring this country abreast of its competitors."

► **Asks B-45 Tests**—The UAL official endorsed suggestion that the U.S. government assign some of its B-45 jet bombers to the airlines for experimental use in hauling cargo, thereby providing actual experience in flying turbine aircraft over American airways.

Herlihy's trip abroad convinced him that the turbine engine "has arrived." It's here, and nothing can stop it, he declared. "The first airline to get the faster, quieter and more comfortable turbine-powered planes into operation will attract the traveling public. Travel in these craft may be more costly to start, but the fare increase will be justified by the added features."

Extension Likely for Western Feeders

The Rocky Mountain area is likely to keep the bulk of its scheduled feeder services for at least three more years.

This became apparent when the Civil Aeronautics Board recently ordered Monarch Air Lines and Challenger Airlines to show cause why their temporary short-haul certificates shouldn't be extended to March 31, 1953. Both franchises are now due to expire at the end of this month.

► **Cite Progress**—CAB said it appears that both Monarch and Challenger have made steady progress in furnishing air service and developing the traffic potential of their routes. The Board tentatively decided to extend the two feeder certificates even before granting approval to the Monarch-Challenger merger last December. CAB said the possible economies resulting from the merger represented an additional reason for continuing the feeder franchises.

Even so, the three-year extensions proposed for Challenger and Monarch are shorter than the five-year extensions previously proposed for Pioneer Air Lines, Southwest Airways, and West Coast Airlines. One feeder, Florida Airways, was put out of business in March, 1949, because of high costs and low traffic.

► **TTA's Struggle**—Another short-haul carrier, Trans-Texas Airways, is fighting for its life. CAB last spring ordered the company to show cause why its certificate shouldn't be permitted to expire on May 13, 1950.

Hearings in the case were held last month, with company officials arguing that TTA's plane mile costs are the lowest of any DC-3 feeder operator and that traffic is increasing steadily. But Post Office representatives contended that TTA's operations are too expensive insofar as mail services are concerned. They said extension of TTA's certificate can only be justified in the interests of the commerce and the national defense.

► **Feeders Justified**—Viewing the feeder experiment as a whole, CAB sees no likelihood that the short-haul carriers will approach commercial self-sufficiency in the foreseeable future. Still, the Board sees enough improvement to justify the hope that with route modifications "and perhaps elimination of certain carriers" the total cost to the government can be further reduced.

CAB said that both Challenger and Monarch, operating in a lightly-populated area, have been somewhat less successful than Pioneer, Southwest, and

West Coast in narrowing the gap between commercial revenues and expense.

However, Challenger and Monarch serve a region where geographical conditions impede surface transportation, thus creating a need for air service.

▶ **Proposed Route Changes**—As in the case of Pioneer, Southwest, and West Coast, CAB has proposed route modifications to strengthen Challenger and Monarch if their certificates are extended.

The revisions would eliminate considerable mileage and more than a dozen towns from the Rocky Mountain feeder network. On the other hand, CAB indicated it may suspend United Air Lines' stop at Rock Springs and/or Cheyenne, Wyo., for three years to eliminate uneconomic duplication of Challenger's service.

Monarch, whose system covers 1020 route miles and 22 stations, currently requires about $1,179,000 in mail pay annually. The company began service in November, 1946. Last year it had around a 25 percent passenger load factor and flew 30,575 passengers over its various routes.

CAB proposes to eliminate Canon City, Colorado Springs, Leadville, Salida, Grand Lake and Boulder, Colo., and Price and Provo, Utah, from MAL's routes.

In addition, CAB plans to eliminate entirely Monarch's inactive link between Denver and Grand Junction, Colo., via Glenwood Springs-Rifle, Craig, Grand Lake and Boulder, Colo.

Merger Argument In Final Stages

The acrimonious word battle over American Airlines' proposed sale of American Overseas Airlines to Pan American Airways for $17,450,000 drew to a close this month as the Civil Aeronautics Board heard oral argument on the deal.

Decision in the case is expected this spring, and many observers have predicted that "good politics" as well as "good economics" will figure in the outcome. Because foreign routes are involved, CAB's decision is subject to Presidential approval. A CAB examiner has already endorsed the merger (AVIATION WEEK, Jan. 2).

▶ **Excessive Competition**—In wrapping up its arguments for approval of the AOA sale, American Airlines emphasized that there is too much air service over the North Atlantic. It said that AOA's traffic to points other than Germany has fallen steadily, and foreign-flag competition has been increasingly effective.

Prospects that American Overseas will earn a profit in the future are bleak,

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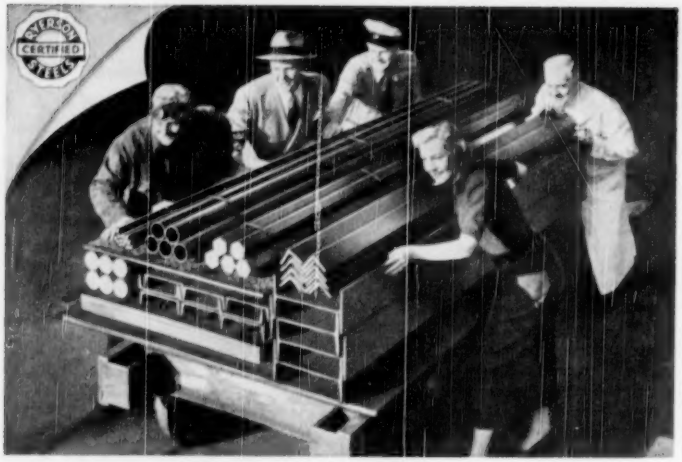

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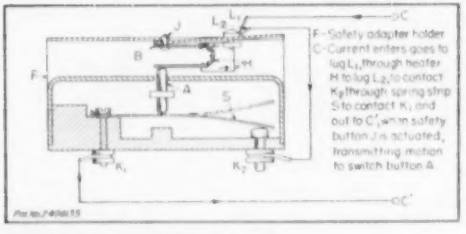
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AA continued. "The subsidy paid by U.S. taxpayers has provided AOA with a profit of only $960,000 over five years of operation, or an average return of 1.1 percent."

▶**AOA Deficit**—Coincidentally, American Overseas released its financial report for 1949, showing an operating loss of $588,477 for the year, a sum which was cut to $348,477 by federal income tax credits. In 1948, AOA had a $991,174 profit after taxes. However, final mail rates have not been fixed for either year.

AOA handled 96,620 passengers in 1949 and had total revenues of $23,416,605. Its fleet at year-end included seven Stratocruisers and seven Constellations.

Both American and PAA argued that TWA will not be hurt by the removal of AOA from the trans-Atlantic picture. On the contrary, they told CAB, TWA should benefit by elimination of a competitor.

▶**Monopoly Issue**—But TWA continued to bang away at the PAA-AOA merger with the assertion that it would result in creation of a monopoly. "PAA's policy in international air commerce," TWA declared, "is not to compete but to destroy."

"It is vital for CAB to recognize that we are Pan American's next intended victim, either to be destroyed or forcibly acquired," TWA continued. It quoted PAA President Juan Trippe as stating that his company wants to become the "chosen instrument" and will stop at nothing to attain that end.

TWA attorneys warned of "Pan American's powerful lobbying activities in Washington," and urged government agencies concerned with the case to make a careful analysis of the facts before making recommendations to President Truman.

MCA Will Buy Four PAA Convair-Liners

Mid-Continent Airlines completed plans to acquire its first postwar equipment when its board of directors recently authorized the purchase of four Convair-Liners and related equipment from Pan American Airways for slightly over $2 million.

J. W. Miller, MCA president, said he hoped to have the Convairs in service on express schedules by June 1. The company's DC-3s (20 of which are now on hand) will continue in service on all routes, with schedules coordinated to supply convenient connections with the Convair-Liner trips.

Delivery of the 40-passenger Convairs to MCA's maintenance base at Wold-Chamberlain Field, Minneapolis, is scheduled to begin Mar. 17. A training program for flight crews, mainte-

nance and ground personnel will be started immediately.

Miller described the four Convair-Liners as "surplus PAA equipment, now in Miami." Sale of the four ships to MCA reduces Pan American's Convair fleet to 16.

GCA Check on ILS Aids UAL Landing

Value of GCA (ground controlled approach) as an independent monitor for the instrument landing system was pointed up recently when the radar device gave prompt warning to a United Air Lines pilot who was coming in to the Chicago airport dangerously below the proper glide slope.

During the instrument approach, the ILS deviation indicator incorrectly showed the transport to be well above the glide path. Flag alarm indication was normal and gave no hint of malfunctioning in the ILS receiver. Nevertheless, the pilot took note of the GCA advisory information and brought his craft in safely.

► **Varistor Failed**—Subsequent flight and bench checks showed that the false indication was caused by failure of a component of the glide receiver. The varistor (instrument rectifier) which rectifies the "fly-up" signal had partially failed so that the glide slope on course as indicated by the aircraft equipment was displaced about 1½ degrees below the normal path angle.

The defect in the airborne receiver was caused either during a bench check or during work in the aircraft junction box by accidental application of 28 volts from an adjacent terminal.

► **Double-Check Wanted**—The incident was believed to be the first of its type in nearly three years of ILS operation. Likelihood of similar difficulties in the future is believed slim. But airline officials said the incident emphasizes the importance of operational procedures which will double-check operation of the ILS system before a descent is made to critically-low altitudes.

Inability of the flag alarm to warn of the type failure experienced by the UAL flight has been recognized previously. Airline chief pilots took note of the situation in 1948 when they recommended that all ILS approach procedures should provide for interception of the glide path at or before passing the outer marker on inbound flights. Purpose of this decision was to permit a check of the glide slope altitude and airborne and ground components of the ILS against the pilot's barometric altimeter when passing through the outer marker.

► **Which is Correct?**—Airline officials recognize that there are frequently minor variations between ILS and CCA

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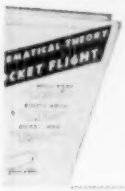

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4. Describes and evaluates various designs developed by the United States, England and Germany and shows the relative progress in each country. Fully illustrated by drawings and sketches, the book emphasizes recent developments with as much projection into the future as security will permit. By L. Neville, Institute of the Aeronautical Sciences, and N. Silsbee, Air Reserve. 227 pages, $4.00

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advisory information but say that this should not detract from the value of GCA equipment in detecting major discrepancies.

It has been suggested that when there is a major conflict in the information furnished by the two systems, such as in the UAL incident, neither source of information should be selected as being most likely correct. Instead, the pilot should use the navigational information which provides the maximum amount of clearance of terrain and obstructions.

Engine Failure Caused Strato-Freight Crash

Worst nonscheduled airline accident in U.S. history—the crash of a Strato-Freight, Inc., C-46 into the ocean near San Juan, P.R., last June 7—has been attributed to engine failure shortly after the plane took off with a 3709-lb. overload.

The mishap, bringing death to 52 of the 75 passengers and one of the six crewmen aboard, caused a tightening of Puerto Rico's regulations governing nonskeds. Because of this crash and previous violations, the Civil Aeronautics Board last November revoked Strato-Freight's operating certificate.

Effective Feb. 5, 1950, CAB also revoked for six months the pilot certificate of the C-46's captain, Lee E. Wakefield.

CAB's investigations disclosed that the C-46's right engine began to backfire and lose power a minute after the plane took off from Isla Grande Airport, San Juan, bound for Miami. Carrying a total gross of 48,709 lb., instead of the 45,000 lb. allowable, the plane failed to maintain altitude and crash-landed in the water six miles from the airport.

► **Wrong Sparkplugs**—At time of crash, wheels and flaps were in retracted position, but the right cowl flaps were fully open, landing lights were extended, and the right propeller was not feathered—all of which reduced the air speed. Thirty of the 36 spark plugs installed in the right engine were not approved for such use by the manufacturer of the plugs, the manufacturer of the engines, or by the U.S. Air Force.

CAB said the Pratt & Whitney R-2800-51 engines in the Strato-Freight C-46 had combustion chamber temperatures and pressures too high for satisfactory operation of AC-I.S-87 plugs. In this instance, the rear spark plug of the right engine's No. 4 cylinder operated at such a high temperature the center electrode fused with the outer electrode.

The plug may have reached this temperature as a result of the engine's operation on only the rear set of spark plugs. This was indicated by the posi-

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tion of the magneto switch, which was found in the "left" position, and by the fact that the front set of plugs showed no evidence of heat, while the rear row showed signs of excessive heat.

▶ **Plugs Dirty**—Spark plug terminals for the right engine were found to be oily and dirty, and spark plug electrodes had too much clearance. Heavy carbon deposits were found on the neoprene adapter sleeve and the carburetor air intake screen of the right engine—an indication of severe backfiring.

The Strato-Freight accident was one of five fatal crashes involving U. S. nonscheduled airline operators last year. A total of eight crewmen and 104 passengers were killed in the mishaps.

WAL Profit Soars

Western Air Lines more than tripled its profit in 1949 as compared with 1948. President T. C. Drinkwater attributed the gains to higher traffic, entrance into the air coach field, a continuing cost reduction program and more efficiency and productivity on the part of employes.

Preliminary unaudited figures show WAL with a $440,000 net profit after taxes last year, equal to 84 cents a share of outstanding capital stock. This compares with $134,704 profit (26 cents a share) in 1948. The company earned over $90,000 during fourth quarter 1949.

Western carried 422,193 revenue passengers last year, up 19.4 percent over 1948. Operating performance for 1949 was 97.72 percent.

Drinkwater announced election of five new WAL directors, bringing the total to ten. Additions are Hector C. Haight, Los Angeles regional manager of the Reconstruction Finance Corp.; John M. Wallace, Salt Lake City banker; Sidney F. Woodbury, Portland, Ore., businessman; Marvin W. Landes, WAL vice president-service; and Alexander Warden, business manager of the Great Falls, Mont., Tribune-Leader.

SHORTLINES

▶ **Air Transport Assn.**—Has joined with the U. S. Chamber of Commerce in requesting complete repeal of both the 15 percent federal tax on transportation and the 3 percent tax on freight. ATA feels that reduction of the passenger tax from 15 to 10 percent (as recommended by the Treasury Department) would have little beneficial effect on the airlines, while full repeal of the levy would increase the carriers' passenger revenue by $20 million annually and cut mail pay needs. The Treasury favors complete repeal of the freight

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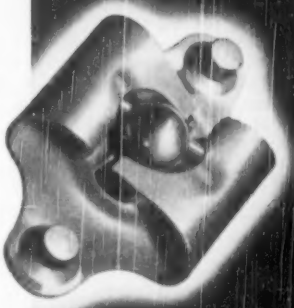

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tax, but ATA says this would benefit the railroads far more than the airlines.

▶**Alitalia**—Has purchased three long-range DC-4s from Pan American Airways, according to A. E. Ulmann & Associates, U. S. agents for the Italian line. Delivery of the planes is to be completed by the end of April, and the ships will be used on the Rome-Buenos Aires run. Italian crews were to be trained at PAA's Miami, Fla., base.

▶**American Air Transport**—CAB has ordered the Miami Springs, Fla., nonscheduled operator to cease and desist from engaging in regular service between New York and Puerto Rico, or between any other points.

▶**Association of American Railroads**—Has called on Congress to end "government subsidization" of airlines, trucks, buses, barge lines, and other competitors of the railroads.

▶**British European Airways**—Believes it will have a marked advantage over competitors when it obtains its all-British fleet of around 60 aircraft now on order. The fleet will include 20-30 four-engine turboprop Vickers Viscounts, 20 twin-engine Airspeed Ambassadors and 14 four-engine Handley Page Marathon feederliners. First Ambassadors are to be delivered in January, 1951; first Viscounts in 1952; and first Marathons in 1951.

▶**IATA**—Turnover of international air transactions at the London clearing house rose from $124 million in 1948 to $167 million in 1949.

▶**Mid-Continent**—Reports a $5912 net profit in January, compared with a $29,794 net loss in the same 1949 month. Operating revenues increased by $78,052 over January, 1949.

▶**Pioneer**—CAB has authorized the feeder to suspend service temporarily at Las Cruces, N. Mex., when operations are inaugurated at that point by Continental Air Lines. PAL said Las Cruces has insufficient traffic for two-carrier service.

▶**San Francisco Airport**—Freight traffic during 1949 jumped 59.7 percent over 1948, and passenger traffic was up 14.7 percent. Total domestic and international passengers handled at the field last year numbered 1,182,570.

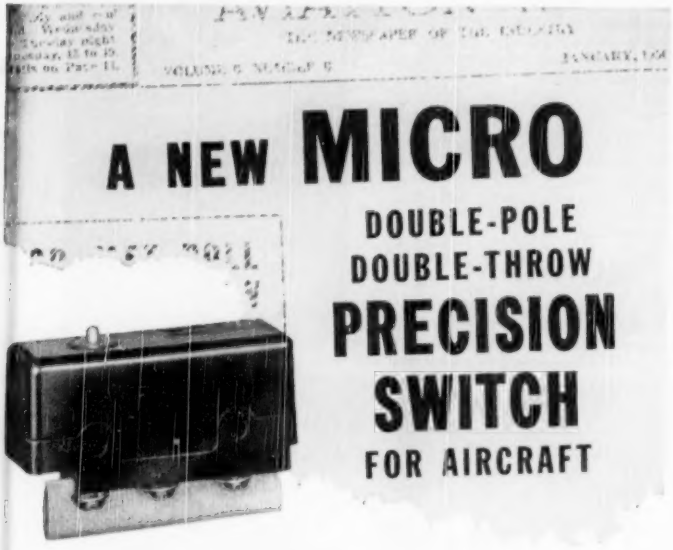
▶**Southern Airways**—Has puchased a DC-3 from TWA, bringing its feeder fleet to six.

▶**Swedish Aerotransport Co.**—Expects to have on hand by June, four of the ten Swedish-built SAAB Scandia aircraft now on order. The Scandia is intended to be a DC-3 replacement.

▶**Trans-Canada**—President Gordon R. McGregor says TCA is looking over the jet airliner field but expects it will be at least 10 years before jet transports are in general use on the airlines.

▶**TWA**—Has started daytime $110 air coach flights between Newark and Los Angeles. Previously the coach ran at night.

▶**United**—Plans sharp cuts in specific commodity rates and volume freight rates this month. . . . Company has assigned cabin stewards to its California-Hawaii Stratocruiser service.



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CAB SCHEDULE

Mar. 13—Resumption of hearing in West Coast Airlines certificate renewal case. (Docket 3966 et al)

Mar. 13—Hearing on Twin Cities-Washington and Detroit through service investigations. (Docket 3661)

Mar. 14—Hearing in National Airlines route transfer case. Postponed from Mar. 6. (Docket 3560 et al)

Mar. 14—Hearing on enforcement action against Peninsular Air Transport, Associated Airlines Agency and National Air Coach Systems. (Docket 4084)

Mar. 15—Reopened hearing in Pioneer Air Line certificate renewal case. (Docket 3719 et al)

Mar. 15—Hearing on enforcement action against Arrow Airways. (Docket 4199)

Mar. 16—Oral argument in Chicago & Southern's application to put Chicago on its Latin American route. (Docket 2864)

Mar. 27—Hearing on enforcement proceeding against National Travel Club, Inc. (Docket 4194)

Apr. 10—Hearing on Florida-Bahamas service. (Docket 2824 et al)

Apr. 17—Hearing on enforcement action against Trans American Airways, Great Lakes Airlines, Golden Airways, Edward Ware Tabor and Sky Coach Airtravel, Inc. (Docket 4161)

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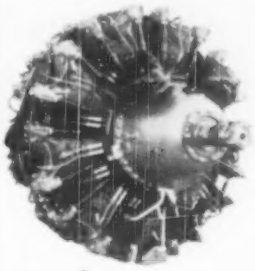

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STRICTLY PERSONAL

OLD TIMER DEPARTMENT—**Willis L. Nye** of San Lorenzo, Calif., answers our recent call for more news about aviation old timers. Early Bird **Harry P. Christofferson** now lives at 370 32nd Ave., San Francisco. "Harry still follows aviation avidly but has been engaged in auto repair for the past 30 years. He and his brother Silas were active from 1909 to the death of Silas at Redwood City, Calif. Harry instructed during World War I at a civilian school at San Carlos and was active till 1920 in this business. He had two other brothers who were pilots."

* * *

HOW WAS THAT AGAIN? There was a brand new hostess on our UAL flight to Youngstown on the morning of Feb. 15 who could compete with radio's Jane Ace or Gracie Allen. At one stop she came out of the pilots' compartment calling back over her shoulder, "You fellows sure are one in a million." We're still trying to figure that out. At Youngstown, as we recall, we were the only passenger getting off. As we were struggling to get a coat out of the rack above, Gracie stood stolidly at the open door, hands folded, and called out in her clarion voice to us up front, "Say, you sure had better be getting out of here fast." It reminded us of **Hy Sheridan's** Sadie.

* * *

THE COCKPIT'S WAFTING ZEPHYRS—And speaking of **Hiram Wilson Sheridan,** our favorite American Airlines pilot philosopher, he tells us about a dreamy young passenger who visited up front at an intermediate stop. The first officer was filling out some of those unending forms. "Oh, I think it is simply marvelous," she gushed, "spending your days flashing around the sparkling sky and the fairyland of clouds." To which the first officer grunted, without looking up, "Yeah, but the truth is the captain smells a little gamey."

* * *

VON FLUGEN'S REPERCUSSIONS—That eminent writer of engineering double-talk, **Herr Doktor H. A. Von Flugen,** is no dope. After we published his startling piece on "The Effects of Cyclical Oscillatory Motions," the doctor suddenly put the bite on us for compensation, and ruined his amateur writer's standing with us. Because there is one principle of undeviating constancy on which we stand. We never allow the taint of lucre to become associated with contributions to this column. You do it for free, for the sheer joy of giving and of sharing with your fellow man. Nevertheless, the crass fellow inserts the commercial element: "I see you published my article. Also, I failed to renew my subscription to your very fine publication (Now, readers, this obviously is flattery with an ulterior motive, as you will see if you read further—Ed. Note) and have been receiving gentle reminders at the rate of one per hour since my previous sub expired. Now, I feel that such a noteworthy space-filler as my article is at least worthy of a free copy of the issue in which it appeared, and is probably worth an honorary subscription to AW. After all, ¾ of a column is ¾ of a column." Incidentally, we are still getting requests for extra copies of the Doktor's treatise.

* * *

HOFFWITTEE IS HUPSET—On the stationery of Airlectron, Inc., at Caldwell, N. J., comes a bitter plaint from **I. M. A. Hoffwittee,** who was mentioned in a footnote to **Von Flugen's** paper. Says he, "I'mtotallIresentmisspellingofmyname. It is **HOFFWITTEE,** pronounced as spelled, with the E silent. More calmly, for I never permit temper to getthebestofme, I wish to clarify a few points brought out in subject memo.

"(1) Apparently, some confusion concerns relative importance, if not indeed the understanding, of the great difference between converse and inverse and involute tracks. CONverse involute tracks are those made by the bearing rotating about its own several axes while rolling along the ground. I mean, of course, the ground inner surface. REverse tracks are, as you can readily comprehend, the opposite effect. INverse involutes are, then, somewhere in between.

"(2) NO difficulty has been experienced with the crystallographic whatchamacallem intercones, because I begin to suspect that some proofreader, incompetent to interpret Dr. Von Flugen's scholarly study, has substituted simple doubletalk!"

And from aviation writer **Ed Bauman** comes a note scrawled on the clipping of "The Effects of Cyclical Oscillatory Motions." Note says "Is this the best you could do while on your honeymoon in Bermuda?" Frankly, Bauman, yes.

R. H. W.

WHAT'S NEW

New Books

"Design Manual on Aircraft Electrical Installations" is the second in a series of manuals by the airworthiness requirements committee on electrical installations of the Aircraft Industries Assn.

Based on practical experience and design knowledge of leading industrial engineers, assisted by USAF, Navy, and CAA electrical specialists, the manual basically covers transport aircraft, but most of its features are equally applicable to military and other types of civil planes.

The 16 chapters treat circuit protection; circuits for essential equipment; cable selection and routing; electrical equipment selection and installation; maintenance, operation, and inspection; electrical system tests, etc.

Copies of the manual may be obtained from The Aircraft Industries Assn., 610 Shoreham Bldg., Washington 5, D. C., price $1.75.

"The Theory and Design of Gas Turbines and Jet Engines" by E. T. Vincent, professor of mechanical engineering, University of Michigan, covers the theory of gas turbines and practical applications of that theory to specific design problems.

Parameters affecting performance characteristics are considered and practical limitations imposed on these parameters by design, materials, etc., are investigated. Limitations imposed on the flow type of combustion process have been developed, as well as some of the conditions governing development of shock, choking, etc.

A number of worked-out problems are included typical of those to be encountered in actual practice, as well as a number of problems for student solution.

Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 18, N. Y., 606 pages, price $7.50.

"The Aircraft Year Book for 1949," 31st edition, official publication of the Aircraft Industries Assn., is aviation's traditional encyclopedia. This edition contains photos and three-views of over 300 U. S. planes, thumb-nail biographies of 1000 contemporary aviation personalities, aviation record listings, etc.

Major portion of the text is taken up by extracts from the reports of President Truman's Air Policy Commission (the Finletter Commission).

Published by The Lincoln Press, Warner Bldg., Washington 4, D. C., 464 pages, price $6.00.

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EDITORIAL

P & W Comes Back—Strong

The spectacular announcement the other day of Pratt & Whitney Aircraft's big, new J-48 turbojet power plant took the headlines.

Overshadowed were two other aspects of the achievement: That Pratt & Whitney reveals the most powerful jet engine now flying in this country only four years after the division wondered whether the future held anything for it at all. And that this was accomplished with wholly owned facilities.

Not any part of its new $12-million turbine laboratory, named after Andrew Dean Wilgoos, the division's chief engineer for 23 years, belongs to Uncle Sam. It is the largest privately owned jet research facility in the world.

Pratt & Whitney's general manager, William P. Gwinn, reminded newsmen in East Hartford the other day that all of the division's facilities—brick and mortar and machinery—are privately owned by United Aircraft Corp.'s 30,000 stockholders. "I know it will interest you to learn that we are the only aircraft engine manufacturer in this country who is not operating with government-owned facilities," he said.

Did this independence slow things up? Hardly.

At war's end P&W didn't see a sign of any turbojet contracts ahead. It had a few production orders for R-2800 and R-4360 piston engines, and that was all the military business on the books. The decision was made to tie in with Rolls-Royce to catch up on a three- to five-year head-start General Electric and Allison were enjoying as a result of similar work with the British. Westinghouse then was in the picture with its own design. Simultaneously, P&W began its own gas turbine development program, aimed at goals surpassing what would be available through Rolls-Royce.

From the time Bill Gwinn came back in 1947 with the Nene blueprints, to the successful flight testing of the J-48 is about two and a half years. Meanwhile, the Nene was converted to U. S. Navy standards, production of the J-42 has been underway for over a year, and the J-48 is flying.

And P&W's own upcoming designs, subject of much current industry comment—a big turboprop and a giant turbojet—are now fighting it out with Allison, General Electric and Westinghouse for their place in the next generation of military planes after the F-93, F-94 and Panther series.

Pratt & Whitney should be proud of its comeback. This is a far cry from 1945 when P&W wondered whether the future held anything for it.

Time to Live

Continental Air Lines has launched an aggressive campaign of public speaking by all of its traffic and sales managers in 29 cities under the direction of William Amlong, public relations chief.

One of the talks, made by Robert Simonson, CAL's traffic chief at Wichita, deserves wider circulation. Titled, "Time to Live," it strikes boldly at fear.

"Our company, through connections with a vast network of airlines, brings you speed in travel, and thus gives you time to live." Simonson first tells his listeners at a civic or women's club somewhere along CAL's route.

"First, though, you must be willing to take advantage of what the airline industry can do for you in this matter of getting time to live. Continental serves your city only insofar as the people here use the service provided. Having something is of little value unless it is used.

"My experience in this business, from actually flying airplanes to selling the service we offer, has taught me that most people who do not fly are not willing to because they are afraid. Very frankly, they are afraid of dying. Who isn't? Since time is our most priceless possession, none of us wants to give up too easily . . . we say!

"Yet, ladies and gentlemen, all too few of these same individuals realize that, instead of shortening their lives, air transportation can lengthen them, in reality, by saving time . . . the stuff of which life is made. Travel by air gives people time to live!

"Words are cheap, you might say. It's facts we want. Well, consider these facts.

"(1) Air travel is 20 times safer than traveling in your own auto. (2) A person can fly one million miles a year for 100 years before risking a fatal airline accident. This would mean, at the average cruising speed of 200 miles an hour, he would fly 208 days and nights each year for 100 years. Or, a person born aboard a commercial airliner and flying constantly for the rest of his life, would have a life expectancy of 57 years. (3) The insurance companies, with all their vast knowledge and statistics on risk, charge no more for airline trip insurance than for rail or other surface transportation.

"For example, an airline passenger may purchase trip insurance at a rate of only 25 cents for each $5000 coverage, to a maximum of $25,000 for $1.25. Assuming each passenger on one of our Convair-Liners purchased a $5000 policy, it would make a total insurance coverage on that flight of one million dollars. The entire premium would be only $50. In effect, then, the insurance company would be betting one million dollars against 50 dollars that it would not be called upon to pay anyone! In addition, the insurance company will make the same deal not just one way, but on a round trip basis, as well, effective for 30 days, and at no extra charge."

Naturally, Simonson and other CAL speakers do not fail to refer to Continental's record of having flown more than 300 million passenger miles in over 15 years without a passenger fatality.

The speech then develops the time saving theme. "You spend your time there, instead of en route. . . . Any place in the world is only as far away as the time it takes to fly there. Distance is no longer measured in miles but in time. . . . When you save time in traveling between two points, you are gaining time to live. . . . The doctor has lengthened your life through medical science, the airlines through shortening the distance between where you are . . . and where you want to be. The air is yours. Use it . . . to get time to live."

One "startling" revelation of the speech program, writes Steward Faulkner, CAL's publicity chief, "is that the audience usually seems as interested in hearing of airline accomplishments of better service as they are in safety statistics. CAL is considering a major reversal of all sales and advertising themes, to do more positive selling and to drop the apparent negative tangents."

Robert H. Wood

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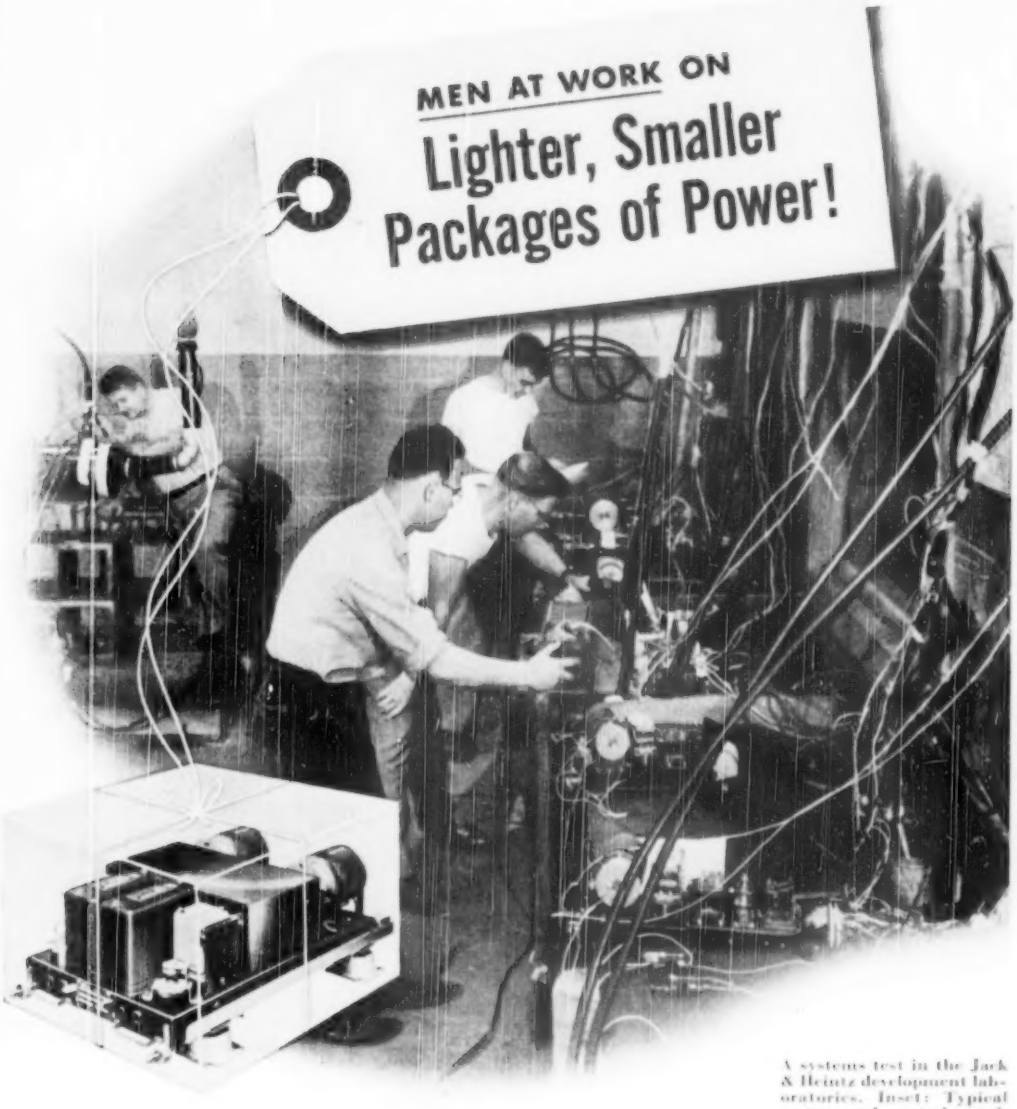

A systems test in the Jack & Heintz development laboratories. Inset: Typical system and control panel.

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